Endless Forms Most Beautiful

The Natural History of Charles Darwin

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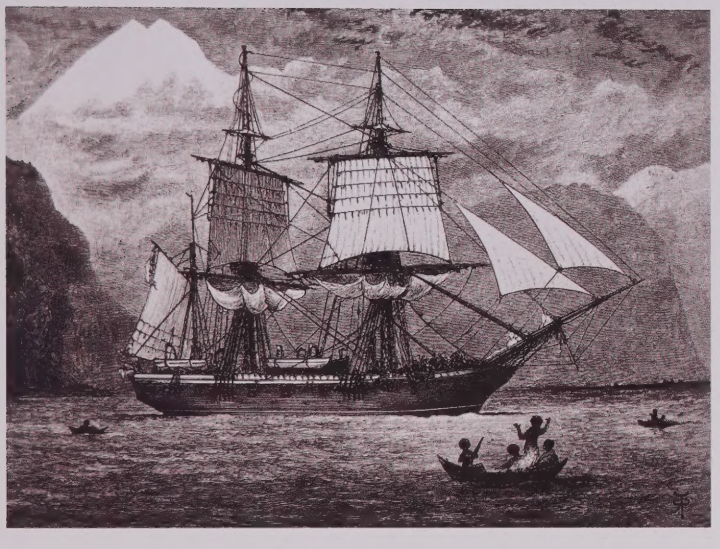

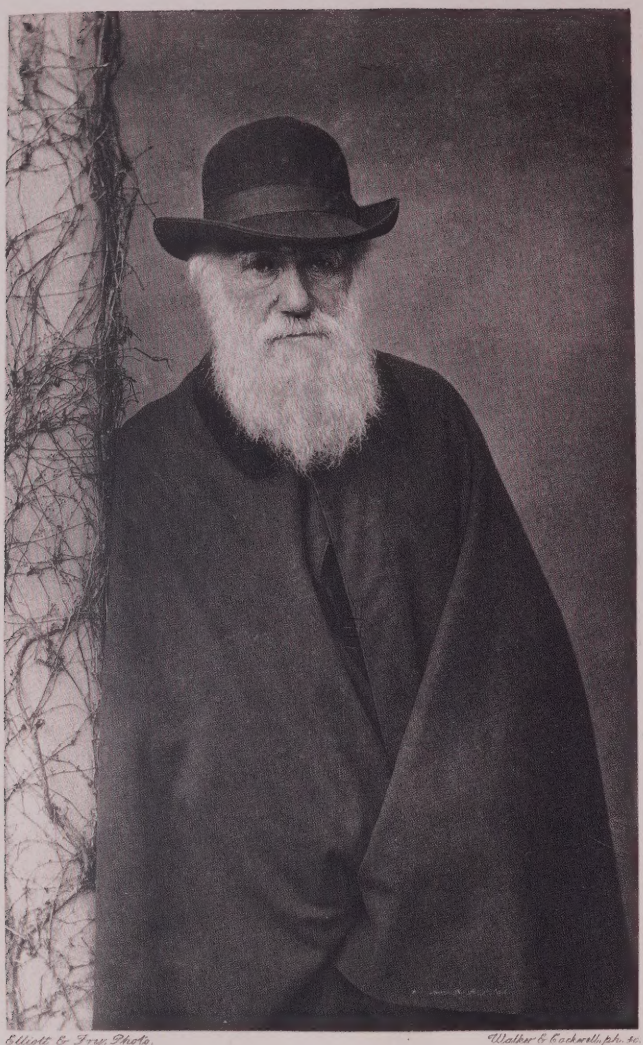

Elliott & Fry, Photo. Walker & Cockerell, ph. sc.

Ch. Darwin

Endless Forms Most Beautiful

The Natural History of Charles Darwin

Exhibition and catalogue by Richard Landon.

Thomas Fisher Rare Book Library, University of Toronto

28 September to 18 December 2009

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Preface

The year 2009 has provided many opportunities for those institutions that wish to celebrate anniversaries with exhibitions. John Calvin (born 1509) has been given due recognition by the Thomas Fisher Rare Book Library with an exhibition and catalogue by Pearce J. Carefoote. Palladio was also born in 1509 and there are Samuel Johnson (born 1709), Robert Burns (born 1759), Edward Fitzgerald (born 1809) and, of course, Abraham Lincoln, whose actual birthday is shared with Charles Darwin. Other notable anniversaries include Edgar Allan Poe (born 1809), A.E. Housman (born 1859), and even Galileo's landmark telescopic discoveries were made in 1609. The most celebrated anniversary this year, however, will be Darwin's who was born in 1809 and whose *Origin of Species* was published in 1859.

The Fisher Library is able to mount this exhibition of Darwin's life and works by virtue of the acquisition of a large foundation collection in 1968 by the University of Toronto from Richard B. Freeman of University College London, Darwin's bibliographer. The collection has been considerably augmented and expanded over the past forty years from many different sources, the most important of which is Eric Korn, the London antiquarian bookseller who wrote of Darwin in the *Times Literary Supplement* of 2 November 1984: 'Charles Darwin is at his most approachable when he is giving way to enthusiasms: exploring with grave delight the "exhaustless fertility of nature"... [and] the curious behaviour patterns of the Darwin domestic animals or the Darwin infants'. The Fisher's Darwin Collection attempts to be comprehensive, by gathering together all the editions, impressions, issues and states of all of Darwin's works in English and in the other languages into which they have been translated.

We are also fortunate to have in Toronto the outstanding private collection of Garrett Herman, from which he has generously lent a few fundamental items. His collection had its own exhibition at The Grolier Club in New York in the winter of 2004.

The Fisher Library collection also contains a considerable number of the works of Darwin's predecessors and contemporaries who wrote on evolution, which provide a context for the

natural science of his time. The collection also includes an extensive literature of books directly influenced by Darwin's work. This exhibition and catalogue contain a selection from the whole collection, an indication of what is available for research in this most vibrant and engrossing field.

The title of this exhibition and catalogue is taken from the final paragraph of *Origin of Species*, a poetical expression of those things that Charles Darwin had observed and attempted to explain.

I began to work with this collection in 1968 and knew Richard Freeman well. My continuing interest is buoyed by the opportunities to discover facets of Darwin's work previously unknown to me, and to add rare works to a collection which will never be 'complete'. Recently several French *desiderata* were offered to me by an English bookseller, and this week I was offered by a prominent American bookseller an extraordinary unpublished letter from Darwin to Charles Kingsley, dated 1 December 1859, which I have had the pleasure of adding to the collection and this exhibition. I wish to thank The Charles Darwin Correspondence Project at Cambridge University for its considerable assistance with the transcription of the letter from Darwin to Kingsley. Particular thanks is offered to my colleagues P.J. Carefoote, Anne Dondertman, and Philip Oldfield for their skilled editorial assistance, and especially Marie Korey, first reader, editor, and shaper of the text. The catalogue could not have been produced without the design acuity and printing skills of Stan Bevington and the Coach House Press and, as always, the generous support of the Friends of the Thomas Fisher Rare Book Library has been crucial.

Richard Landon
Director
16 July 2009

Introduction

It is conventional to view the life and career of Charles Darwin as divided neatly into two parts: before and after the publication of *Origin of Species*, generally regarded as the most influential biological work ever written, and yet his life and his work were inseparable. He was raised, however, to be a conventional Victorian gentleman of means and continued to live in that mode, having, as he put it, had 'ample leisure from not having to earn my own bread'. What set him apart from his contemporaries in similar circumstances was what went on in his mind, and while any bare account of his personal life, apart from the years 1831 to 1836, would be of interest only to his family, the many investigations of his scientific research and its implications are full of fascination and excitement. He was most certainly not a commonplace Victorian gentleman.

Darwin summed up his career in the 'Autobiography' he wrote for his children in 1876, which displayed his usual modesty regarding his accomplishments:

> Therefore my success as a man of science, whatever this may have amounted to, has been determined, as far as I can judge, by complex and diversified mental qualities and conditions. Of these, the most important have been – the love of science – unbounded patience in long reflecting over any subject – industry in observing and collecting facts – and a fair share of invention as well as of common sense. With such moderate abilities as I possess, it is truly surprizing that I should have influenced to a considerable extent the belief of scientific men on some important points.

Although he perhaps experienced his greatest sense of satisfaction by having proven the truth of his theories to most of the cogent minds of his time, his ideas had a profound and direct impact on every layer and aspect of society and quickly spread from Great Britain throughout the world. The implications of the theory of natural selection are as widely and fiercely debated today as they were in his own era.

Charles Robert Darwin was born at The Mount, Shrewsbury

on 12 February 1809, a natal day shared by Abraham Lincoln. His father, Robert Waring Darwin, was the most successful medical practitioner in the area; a very large, forceful, intelligent man described by his son as having more highly developed powers of observation and sympathy than any man he had known. Dr. Darwin, treated by his family with great respect and not a little awe, was also a sagacious man of business, acting as a kind of private banker and investor. He increased his fortune to the extent that his family, including Charles, were comparatively wealthy for the whole of their lives. The careful management of money and a certain level of frugality were traits fully inherited by his son, who worried continually about adequate provision for his own family. Darwin's grandfather was the famous physician and scientist, Erasmus Darwin, who died in 1802 before Charles was born. Erasmus Darwin's book *Zoonomia* (1794), which discussed the mutability of species, was read by Charles but it did not, according to him, have any influence on the development of his theories. When he decided to write his 'Autobiography' for his children, one of his motives was his regret that his grandfather had not provided a similar document for his descendants. Charles Darwin's mother, Susannah Wedgwood, died when Charles was only eight years old, but the close connections between the two families were maintained. He eventually married Emma Wedgwood, his first cousin, after spending much of his youth under the direct influence of her father, Josiah Wedgwood, the head of the famous firm of porcelain manufacturers.

Darwin's boyhood was happy and conventional. He attended Shrewsbury School under the Headmastership of Samuel Butler, who later became Bishop of Lichfield and was the grandfather of Samuel Butler, author of *Erewhon* and a Darwinian opponent. At school Darwin became a keen hunter of birds, but did not display any marked scholarly inclinations. In 1825 his father sent him to study medicine at Edinburgh University, where his only brother, Erasmus, was already in attendance. This venture proved unsuccessful and in 1827 Darwin entered Christ's College, Cambridge, to prepare himself for a career in the Church of England. He graduated in 1831 apparently without much sense of a theological vocation but with a keen amateur interest in natural history, particularly the collecting of beetles. At Cambridge he had been much influenced by the Reverend John Stevens Henslow (1796-1861), Professor of Botany and a prominent naturalist. Henslow

determined the course of Darwin's career by recommending him for the post of naturalist on the *Beagle*, a surveying ship commanded by Captain Robert Fitz-Roy, about to depart on a voyage to South America. After obtaining his father's permission, through the intervention of his uncle Josiah, on 27 December 1831 Darwin embarked upon the great adventure of his life. He sailed as Fitz-Roy's guest and the *Beagle* remained his floating home for the five-year duration of the voyage, although he spent more than half of his time ashore making observations and collecting geological specimens, flora, and especially fauna, and thus in effect becoming the naturalist of the expedition. He began the voyage with the newly published first volume of Charles Lyell's *Principles of Geology* with its clearly expressed principles of Uniformitarianism which became a major influence on the development of Darwin's theories throughout his career – a fact often acknowledged by Darwin himself. The effect of his experience on the Galapagos Islands was especially significant. He recorded in his journal, 'we seem to be brought somewhat near to that great fact – that mystery of mysteries – the first appearance of new things on this earth'.

Darwin returned to England with the *Beagle* in 1836 more confident, with a sense of independence, and the prospect of a vocation before him. That the experience of the voyage had changed him was made evident when he appeared for breakfast at The Mount on 5 October at which his father remarked, 'Why, the shape of his head is quite altered'. He was now a published author with the beginnings of a reputation as a naturalist. He immediately set about arranging his collections of specimens and editing the geological and biological results of the voyage. He also began to prepare his *Journal* for publication. In 1839 he married Emma Wedgwood, after having drawn up a balance sheet on which he tabulated the advantages and disadvantages of matrimony, was elected a Fellow of the Royal Society, and plunged into the busy and exciting affairs of London scientific society. At about this time he began to develop the symptoms of ill-health that were to plague him for the rest of his life, the causes of which remain largely a mystery. In 1842 the Darwins moved to the seclusion of Downe in Kent where they raised a large family, and where Charles continued his researches on the materials from the voyage, much supplemented by local observations and the many collections sent to him by his network of far-flung correspon-

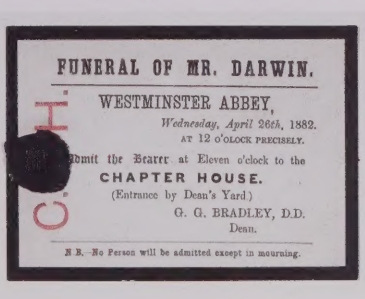
dents. Although his reading of Thomas Malthus on population in 1838 provided the spark with which he was able to synthesize his theory, he had already accumulated a great deal of evidence which was recorded in his note-books on transmutation, begun in 1837.

From 1846 to 1854 Darwin worked on the classification of barnacles, both living and fossil and this 'little zoology' served the purpose of training his powers of observation and identification which would become abundantly evident in all his later works. In 1856 he began to write a 'large work on species', which was dramatically interrupted by the famous communication from Alfred Russel Wallace in 1858, containing as it did a virtually perfect statement of his own theory of natural selection. The joint papers *On the Tendency of Species to Form Varieties* was read to the Linnean Society on 1 July of that year and Darwin set hurriedly to work to prepare the *Origin of Species* for publication on 24 November 1859. He knew the book would be controversial and was not disappointed. Both it and its theories were widely and vociferously attacked and his supporters, especially T.H. Huxley, ranged themselves in defence. By and large Darwin kept himself personally out of the fray while maintaining a close interest and providing encouragement and support. He continued to revise *Origin* through six editions and to work on the series of some ten books which provided even more evidence to support his theory. They fully occupied his time up to 1881 and constitute the bulk of his published work.

On 19 April 1882 Charles Darwin died quietly at Down House, his beloved home for forty years. His large and closely knit family wished to have him buried in the churchyard of the village of Downe, a resting place he had more than once mentioned himself. However, a group of twenty Members of Parliament, headed by Sir John Lubbock, wrote to the Dean of Westminster on 21 April: 'We hope you will not think we are taking a liberty if we venture to suggest that it would be acceptable to a very large number of our countrymen of all classes and opinions that our illustrious countryman Mr. Darwin should be buried in Westminster Abbey'. The Dean, G.G. Bradley, cordially acquiesced and Darwin's body was carried from Downe to London in a hearse drawn by four black horses. The funeral was conducted on 26 April by Canon George Prothero in the presence of the large extended family and old and intimate friends. The pall bearers, Joseph Hooker, Thomas Huxley, Alfred Wallace,

and Sir John Lubbock, were joined by dignitaries: James Russell Lowell, the American Ambassador; the Duke of Devonshire, Chancellor of Cambridge; and William Spottiswoode, President of the Royal Society. The Queen was represented by Earl Spencer, President of the Council. An anthem was specially composed by Sir Frederick Bridge, based on the text of Proverbs iii, 13, 'Happy is the man that findeth wisdom, and the man that getteth understanding'.

Darwin is the only naturalist buried in Westminster Abbey. He lies next to Sir John Herschel and a few feet away from Sir Isaac Newton, with whom he is often compared for his enduring scientific influence. Darwinism, the theory of natural selection, and the much more complex ramifications of the theory developed since 1859 continue to be investigated today, engendering serious and lively discussion and debate in this sesquicentennial year, and will no doubt continue to do so.



FUNERAL OF MR. DARWIN.

WESTMINSTER ABBEY,

Wednesday, April 26th, 1882.

AT 12 O'CLOCK PRECISELY.

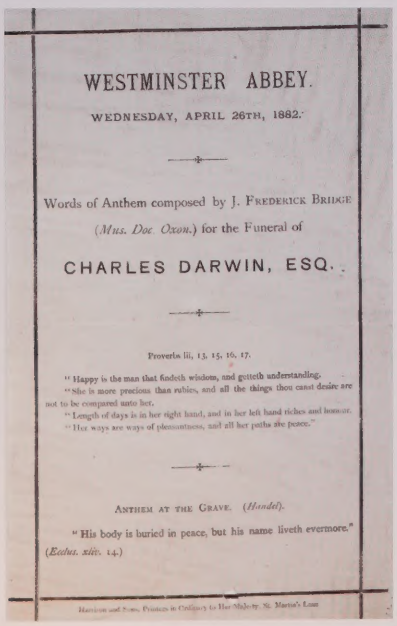
[illegible]dmit the Bearer at Eleven o'clock to the

CHAPTER HOUSE.

(Entrance by Dean's Yard.)

G. G. BRADLEY, D.D.
Dean.

N.B.—No Person will be admitted except in mourning.



WESTMINSTER ABBEY.

WEDNESDAY, APRIL 26TH, 1882.

Words of Anthem composed by J. FREDERICK BRIDGE (*Mus. Doc. Oxon.*) for the Funeral of

CHARLES DARWIN, ESQ.

Proverbs iii, 13, 15, 16, 17.

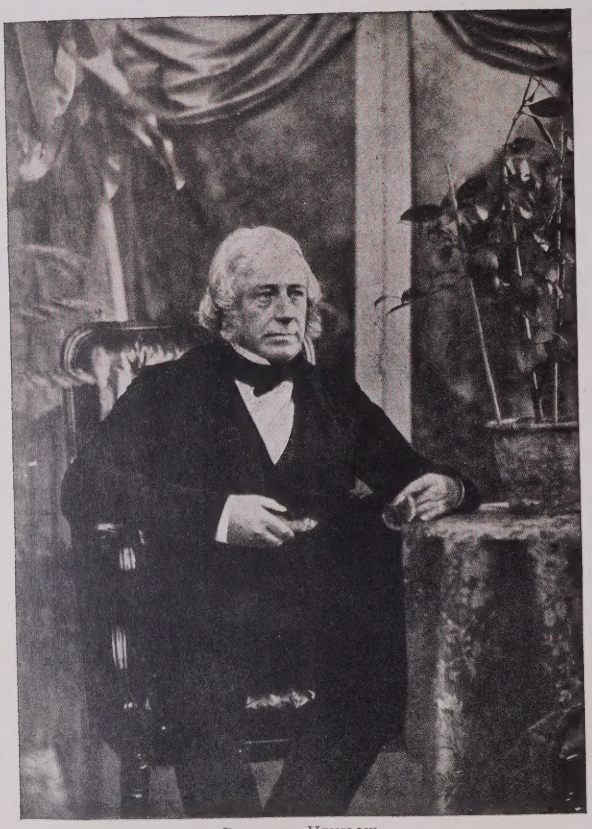
"Happy is the man that findeth wisdom, and getteth understanding.
"She is more precious than rubies, and all the things thou canst desire are not to be compared unto her.
"Length of days is in her right hand, and in her left hand riches and honour.
"Her ways are ways of pleasantness, and all her paths are peace."

ANTHEM AT THE GRAVE. (*Handel*).

"His body is buried in peace, but his name liveth evermore."
(*Ecclus. xliv.* 14.)

Harrison and Sons, Printers in Ordinary to Her Majesty, St. Martin's Lane

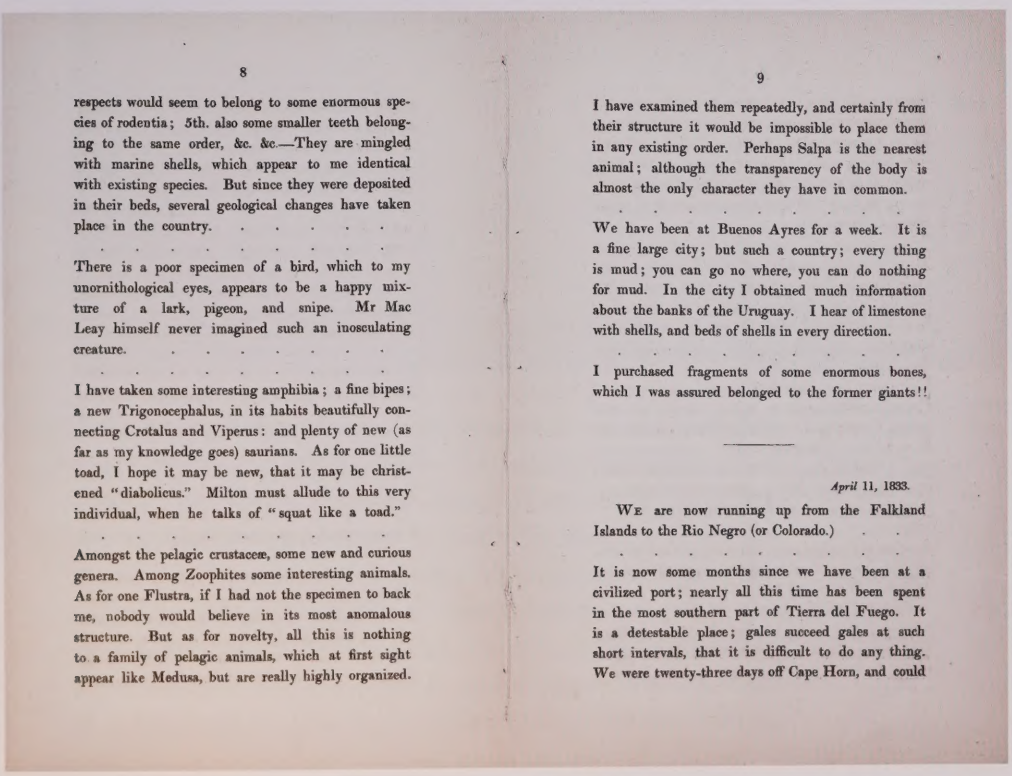
Garrett Herman Collection



PROFESSOR HENSLOW

Letters on Geology

Although often referred to as Darwin's first published work, this pamphlet was privately printed for the members of the Cambridge Philosophical Society in December 1835, while Darwin was still aboard the *Beagle*, sailing from Tahiti to New Zealand. It consisted of extracts from ten letters sent by Darwin to the Reverend John Stevens Henslow (1796-1861), the Cambridge Professor of Botany who was his friend and mentor from 1827 to the end of his life. Darwin did not know of its existence until June 1836 when he learned of it through a letter from his sister Emily and, in his reply, wrote that he was 'a good deal horrified' that 'what has been written without care and accuracy' should have been put into print. Henslow had, however, stated in his preface that 'the opinions here expressed must be viewed in no



8

respects would seem to belong to some enormous species of rodentia; 5th. also some smaller teeth belonging to the same order, &c. &c.—They are mingled with marine shells, which appear to me identical with existing species. But since they were deposited in their beds, several geological changes have taken place in the country. . . . . .

. . . . . .

There is a poor specimen of a bird, which to my unornithological eyes, appears to be a happy mixture of a lark, pigeon, and snipe. Mr Mac Leay himself never imagined such an inosculating creature. . . . . .

. . . . . .

I have taken some interesting amphibia; a fine bipes; a new Trigonocephalus, in its habits beautifully connecting Crotalus and Viperus: and plenty of new (as far as my knowledge goes) saurians. As for one little toad, I hope it may be new, that it may be christened "diabolicus." Milton must allude to this very individual, when he talks of "squat like a toad."

. . . . . .

Amongst the pelagic crustaceæ, some new and curious genera. Among Zoophites some interesting animals. As for one Flustra, if I had not the specimen to back me, nobody would believe in its most anomalous structure. But as for novelty, all this is nothing to a family of pelagic animals, which at first sight appear like Medusa, but are really highly organized.

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I have examined them repeatedly, and certainly from their structure it would be impossible to place them in any existing order. Perhaps Salpa is the nearest animal; although the transparency of the body is almost the only character they have in common.

. . . . . .

We have been at Buenos Ayres for a week. It is a fine large city; but such a country; every thing is mud; you can go no where, you can do nothing for mud. In the city I obtained much information about the banks of the Uruguay. I hear of limestone with shells, and beds of shells in every direction.

. . . . . .

I purchased fragments of some enormous bones, which I was assured belonged to the former giants!!

April 11, 1833.

We are now running up from the Falkland Islands to the Rio Negro (or Colorado.) . . .

. . . . . .

It is now some months since we have been at a civilized port; nearly all this time has been spent in the most southern part of Tierra del Fuego. It is a detestable place; gales succeed gales at such short intervals, that it is difficult to do any thing. We were twenty-three days off Cape Horn, and could

other light than as the first thoughts which occur to a traveller respecting what he sees, before he had had time to collate his Notes, and examine his Collections, with the attention necessary for scientific accuracy'. Despite his reservations the *Letters on Geology* did introduce Darwin's name and some important observations to a small but influential group of scientists and he arrived back in England in the autumn of 1836 with something of a reputation as a geologist. It is not known how many copies were printed, but there must have been very few as it is extremely rare and seldom appears for sale. Henslow was also the recipient of Darwin's collections of thousands of specimens from the *Beagle* voyage which Henslow carefully preserved for study upon Darwin's return and from which emerged the theory of natural selection.

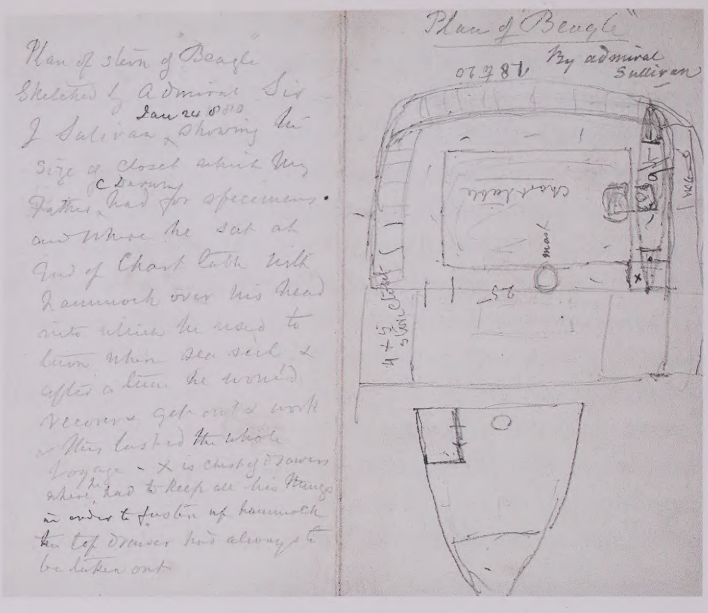
The Voyage of the Beagle

Darwin's first major work, based on the diary and notebooks he kept on the *Beagle* voyage, was the *Journal of Researches*, or, as it eventually became commonly known, *The Voyage of the Beagle*. It was a personal record of his journey, filled with scientific observations and evidence, and thus a key work for understanding the concept of evolution by natural selection and the process by which Darwin developed his theory. It also became widely recognized as one of the great travel narratives of the nineteenth century, with many reprints and editions which continue to be published, and is the most widely read of all his works. It was first issued as the third volume of the *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle, Between the Years 1826 and 1836; Describing their Examination of the Southern Shores of South America, and the Beagle's Circumnavigation of the Globe* (London: Colburn, 1839). Darwin's manuscript was completed in June 1837 and was printed by early 1838, but publication had to wait until the other two volumes and an appendix had been completed. The second issue also appeared in 1839 and Darwin's volume now became a separate monograph, with six of the preliminary pages cancelled and replaced with a title-leaf which read: *Journal of Researches into the Geology and Natural History of the Various Countries Visited by H.M.S. Beagle, Under the Command of Captain Fitzroy, R.N. from 1832 to 1836.* The actual sheets of text were from the first issue. It seems likely that because

public demand for Darwin's volume far exceeded that for the rest of the set, it was put on the market by Colburn in late 1839 as a separate volume. A third issue, dated 1840, with new and conjugate title and half-title leaves was also published, and the three issues together constitute the whole of the first edition. Darwin recorded in his diary that 1500 copies had been printed, selling 1337 copies by 1842. John Murray published the second edition in 1845, with the title altered to read *Journal of Researches into the Natural History and Geology of the Various Countries*, having purchased the copyright from Darwin for £150. It has been claimed the altering of the position of 'geology' and 'natural history' in the title indicated a change in Darwin's primary interests between 1839 and 1845 as he studied the results of the *Beagle* expedition and thus can be seen as a part of the development of his theories. Certainly the text was extensively revised, reducing

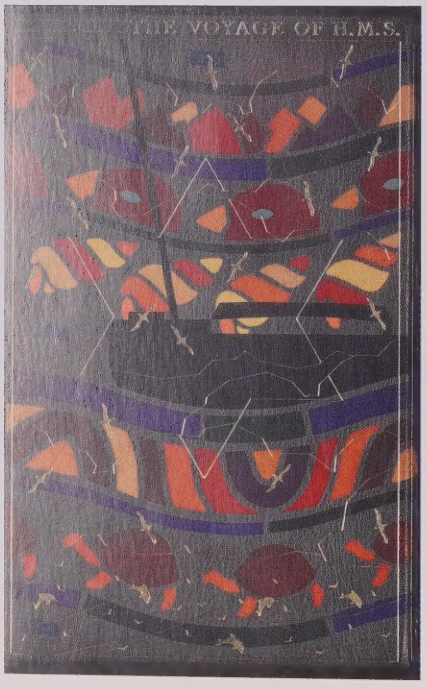
Fore-edge painting on a second edition of *Journal of Researches*

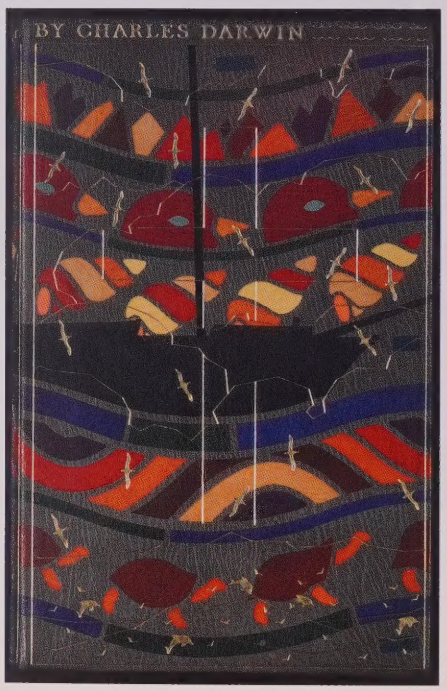
the number of words from about 224,000 to 213,000. The first issue appeared as numbers XXII-XXIV of Murray's 'Home and Colonial Library', bound in the grey-buff card of the series but only the first two parts seem to survive in that form (and are among the Fisher Library's collections). It was also issued in 1845 as Vol. XII of the 'Home and Colonial Library', combining the three parts, available bound either in red morocco or cloth. The first American edition was published by Harper & Brothers in New York in 1846 as volumes X and XI of their 'New Miscellany'.



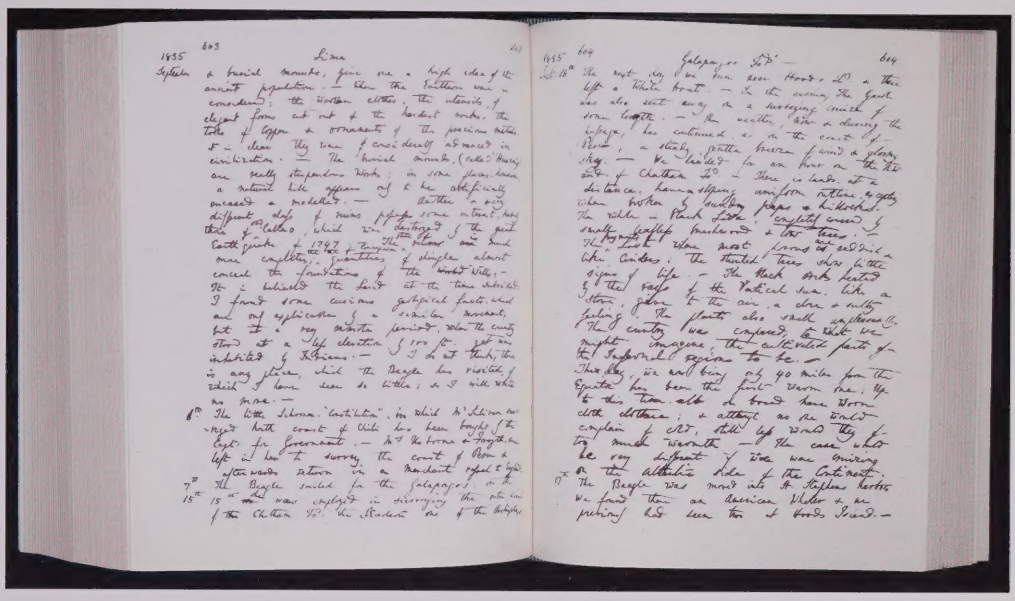
Sketch of Darwin's accommodation on the *Beagle* by Admiral Sulivan

In 1860 Murray published a new edition ('Tenth Thousand') with new preliminaries and a postscript and this remained the final text as Darwin left it. It was now bound in green cloth, the standard covering for all the Murray editions of Darwin's books. It has remained in print ever since, with over a hundred editions, many





Design binding by Michael Wilcox on the 1956 ed. of *Journal of Researches*. Garrett Herman Collection



1979 facsimile of Darwin's manuscript journal from the Beagle voyage

of them extensively illustrated by different artists. The manuscript *Journal*, from which Darwin created *The Voyage of the Beagle*, was also published by Lady Nora Barlow, Darwin's granddaughter, in 1934, and in full facsimile, with a preface by Charles, Prince of Wales, in 1979.

The Zoology of the Voyage of H.M.S. Beagle

The first of the scientific results of the *Beagle* voyage began to appear in February of 1838 when the first number of *Fossil Mammalia*, by Richard Owen (1804-1892) was issued. Its wrapper announced that the whole work, in five parts, consisting of nineteen numbers, would be 'edited and superintended by Charles Darwin'. The original schedule called for a part to be issued on the first day of every second month, but Darwin encountered the usual difficulties of keeping his authors and artists on schedule with the result that the final number of Part V was not published until October 1843. It had taken Professor Thomas Bell almost five years to produce fifty pages of text on reptiles. The most sumptuous of Darwin's books, the complete work contained 632 pages of text and 166 plates (mostly lithographs), eighty-two of them hand-coloured. He wrote the geological introduction to Part I, which became somewhat ironic after the publication of *Origin*, when Owen bitterly and spitefully attacked Darwin's

A Pampas Cat, *Zooology* Mammalia

Brazilian bat named for John Grey, *Zooology* Mammalia

Porpoise named for Captain Robert Fitz-Roy, *Zooology* Mammalia

Galapagos Finches, *Zooology* Birds

Mice, *Zooology* Mammalia

work and continued to do so for the rest of his long life. Part I, no. 1 was followed by Part II, no. 1, *Mammalia*, by George Robert Waterhouse (1810-1888), for which Darwin wrote a geographical introduction, and the numbers continued to appear in the order in which they were completed. Thus no. 4 of *Fossil Mammalia* was not issued until April 1840. Individual numbers survive in their wrappers, but the complete *Zoology* is normally encountered in

Rhea Darwinii, named by John Gould after Darwin, *Zoology* Birds

two or three volumes. *Mammalia* contained ten coloured lithographic plates, but none of them was signed. Part III was *Birds* by John Gould, with fifty gorgeous hand-coloured lithographs, which has made it the most desirable of the parts. In fact, both authorship and art work were shared with his wife Elizabeth and, because Gould went to Australia in the spring of 1838, the text was completed by George Robert Gray (1808-1872) of the British Museum. Darwin contributed notes on habits and ranges and there is a depiction of *Rhea Darwinii*, a new species of ostrich named for him by Gould. The bird had been shot for Christmas lunch in 1833 and most of it had been consumed by the crew of the *Beagle* before Darwin realized that it was a previously unrecorded variant. Enough of it was saved to be sent back to England for

identification. Part IV, no. 1: *Fish* by Leonard Jenyns (1800-1893), was published in January 1840 and it was completed with no. 4 in April 1842. It contained twenty-nine plates by Benjamin Waterhouse Hawkins (1807-1889). Jenyns was Henslow's brother-in-law, an Anglican priest, and a friend of Darwin. In 1862 he published a *Memoir* of Henslow, with 'recollections' by Darwin. Both he and Henslow had been invited to join the *Beagle* voyage before Darwin. The final part of *Zoology* was *Reptiles* by Thomas Bell (1792-1880), a physician, dental surgeon, and Professor of Zoology at King's College, London. It had twenty plain lithographed plates, also by Waterhouse Hawkins. Many of the notes were by Darwin as they had been in all the parts. Darwin had received £1000 from the Treasury in August 1837 to cover the costs of what was to be an expensive undertaking, but both Smith, Elder, and Darwin himself had to contribute more money to the project. There are no surviving records of how many copies were published, but it cost £8.15s. unbound in parts and £9.2s. bound in cloth, a volume for each part. The press run was presumably limited and complete sets are now scarce, exemplified by the two-volume set from Garret Herman's collection included in this exhibition. A facsimile of it was published in 1994.

The Geology of the Beagle Voyage

Darwin published three books on the geological results of the *Beagle* voyage between 1842 and 1846, but they were intended to be parts of one work and were described as such on their title pages. They were all published by Smith, Elder with the approval of the Lords Commissioners of the Treasury, financed, theoretically, by the £1000 advanced for the *Zoology*; by May 1842, however, Darwin noted that 'the government money has gone much quicker than I thought' and the cost of *Coral Reefs* would be £130-140. *The Structure and Distribution of Coral Reefs* was published in May 1842 at a cost of 15s. and became his most important geological work. In it he proposed a theory of 'subsidence' to account for the formation and structure of coral reefs, particularly the great depth of water through which they rose from the ocean floor to the surface and the perfect hemispheres they formed around low-lying islands. His theory proved to be substantially correct, although it was disputed by many geologists and further research was done by James Dwight Dana (1872) and Joseph Beele Jukes (1847). The second edition of *Coral Reefs* (1874) was extensively revised and rewritten to take account of these criticisms as well as others.

The second volume of *Geological Observations* was published in 1844 and entitled *Geological Observations on the Volcanic Islands*, many of which were visited by the *Beagle*. Darwin also took the opportunity to include observations on the geology of Australia and the Cape of Good Hope. There was also a description of six species of corals from the Palaeozoic formation of Van Diemen's Land, by William Lonsdale, added at the end. The third part of the geological trio was published in 1846, entitled *Geological Observations on South America*. It provided a substantial appendix to the text of the *Journal of Researches* and included descriptions of secondary fossil shells by George B. Sowerby and Edward Forbes. In 1851 the three works were combined into one volume by Smith, Elder using the original sheets of the three books, but with their title leaves discarded and a new general title added. That publisher also brought out a second volume of *Volcanic Islands* and *South America* in 1876 and various combinations of the parts have been reprinted throughout the nineteenth and twentieth centuries.

Plate 3. SHEWING THE DISTRIBUTION OF THE DIFFERENT KINDS OF CORAL REEFS, TOGETHER WITH THE POSITION OF THE ACTIVE VOLCANOS IN THE MAP. (SEE NOTE IN LEFT HAND CORNER.)

Published by Smith, Elder, & Co. 65 Cornhill.

Cirripedia

While on the coast of Chile in 1834 Darwin discovered a peculiar species of burrowing barnacle for which he had to create a special sub-order. These small, but complex creatures sufficiently interested him that after the publication of *Geological Observations on South America* in 1846, he decided to do what he described as a 'little zoology', choosing the cirripedes as his subject. Eventually he had some ten thousand specimens from all over the world to dissect and study and his direct involvement with both the living and fossil forms of barnacles lasted for eight years. In 1852 he recorded in a letter to William Darwin Fox, his second cousin, that 'I hate a barnacle as no man ever did before, not even a sailor

in a slow-sailing ship'. The two volumes on the living cirripedes were published by the Ray Society in 1851 and 1854 as numbers 21 and 25 of its *Publications* and although neither volume gives any indication that they are part of the same work, they are collectively called *A Monograph on the Sub-Class Cirripedia* and are generally known as *Living Cirripedia*. The *Fossil Cirripedia* was published in two volumes again in 1851 and 1854 by the Palaeontographical Society, in which Darwin confined himself to a study of the fossil barnacles of Great Britain. The title of the first volume was *A Monograph on the Fossil Lepadidae*, the second volume being called *A Monograph on the Fossil Balanidae and Verrucidae*. Again the title pages do not link the two works, but the preface to volume two states that it completes the work. These four volumes constitute Darwin's only contribution to formal taxonomy and contain some genuine discoveries. Darwin was pleased with them and, although obviously relieved at their completion, felt that the sustained work on them provided something of the formal scientific training he had never received. Although some of his friends felt that he had wasted eight years on minutiae these works are still considered standard authorities in their field.

Manual of Scientific Enquiry

Darwin did not spend all his time between 1846 and 1854 working on barnacles. In 1849 Sir John F.W. Herschel (1792-1871) edited *A Manual of Scientific Enquiry; Prepared for the Use of Her Majesty's Navy and Adapted for Travellers in General* to which Darwin contributed the chapter on geology. It consisted of suggestions for the aspiring geologist concerning what to look for, how to describe what was observed, and how to record and preserve specimens of evidence. The book proved popular and went through six editions up to 1906. In the first edition part of the text of Darwin's article was transposed by a compositor, but only in some copies, thus creating two 'states'. Darwin also had a repaginated offprint made in 1849 with the corrected text, its title being *Geology* and offprints exist from the third and fourth editions as well.

Huxley Testimonials

Thomas Henry Huxley (1825-1875) applied for the Chair of Natural History at the University of Toronto in 1851. He obtained fourteen testimonials and had them printed as a pamphlet which is now very rare, the University of London and the University of Toronto copies being the only ones recorded. Darwin's contribution though brief (five lines), was warm and commendatory. Huxley was twenty-six years old and just back from the voyage of the *Rattlesnake*, but despite his obvious scientific qualifications the post was given to William Hincks, a Unitarian minister and brother of Sir Francis Hincks, the Premier of what became the Province of Ontario. (The University of Toronto also turned down John Tyndall (1820-1893) for the Chair of Physics in 1853.) The term 'Darwinism' was first used by Huxley in 1864 in the *Natural History Review* as 'what we may term the philosophical position of Darwinism' and it has been applied to almost every sphere of human activity, from linguistics to sociology, often far removed from Darwin's own focus as expressed in *Origin of Species*.

On the Tendency of Species to Form Varieties

On 18 June 1858 Darwin's work on the 'large book', which was to include the results of his research on the species question up to that point, was interrupted by the famous communication from Alfred Russel Wallace, written from the Malay Archipelago where he was collecting natural history specimens. It contained a virtually exact statement of Darwin's own theory of evolution by natural selection. The same day Darwin wrote to Lyell that 'your words have come true with a vengeance – that I should be forestalled'. Lyell, however, together with Hooker, took a more reasoned approach to the problem of precedence and suggested that Darwin write an outline of his own theory to be submitted, together with that of Wallace, to the Linnean Society. In what must be one of the most notable cases of cooperation rather than competition in the announcement of a major scientific discovery, on 1 July 1858 'On the Tendency of Species to Form Varieties, and on the Perpetuation of Varieties and Species by Natural Means of

On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection. By Charles Darwin, Esq., F.R.S., F.L.S., & F.G.S., and Alfred Wallace, Esq. Communicated by Sir Charles Lyell, F.R.S., F.L.S., and J. D. Hooker, Esq., M.D., V.P.R.S., F.L.S., &c.

[Read July 1st, 1858.]

London, June 30th, 1858.

My Dear Sir,—The accompanying papers, which we have the honour of communicating to the Linnean Society, and which all relate to the same subject, viz. the Laws which affect the Production of Varieties, Races, and Species, contain the results of the investigations of two indefatigable naturalists, Mr. Charles Darwin and Mr. Alfred Wallace.

These gentlemen having, independently and unknown to one another, conceived the same very ingenious theory to account for the appearance and perpetuation of varieties and of specific forms on our planet, may both fairly claim the merit of being original thinkers in this important line of inquiry; but neither of them having published his views, though Mr. Darwin has for many years past been repeatedly urged by us to do so, and both authors having now unreservedly placed their papers in our hands, we think it would best promote the interests of science that a selection from them should be laid before the Linnean Society.

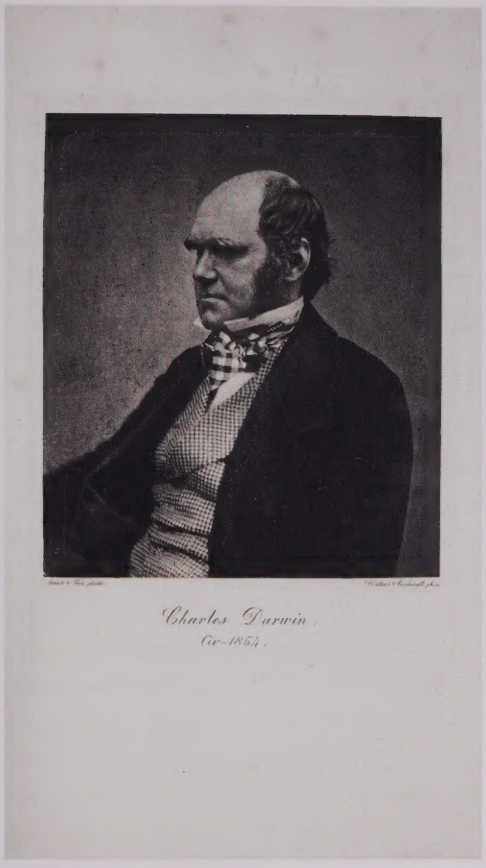
Taken in the order of their dates, they consist of:—

1. Extracts from a MS. work on Species*, by Mr. Darwin, which was sketched in 1839, and copied in 1844, when the copy was read by Dr. Hooker, and its contents afterwards communicated to Sir Charles Lyell. The first Part is devoted to "The Variation of Organic Beings under Domestication and in their Natural State;" and the second chapter of that Part, from which we propose to read to the Society the extracts referred to, is headed, "On the Variation of Organic Beings in a state of Nature; on the Natural Means of Selection; on the Comparison of Domestic Races and true Species."

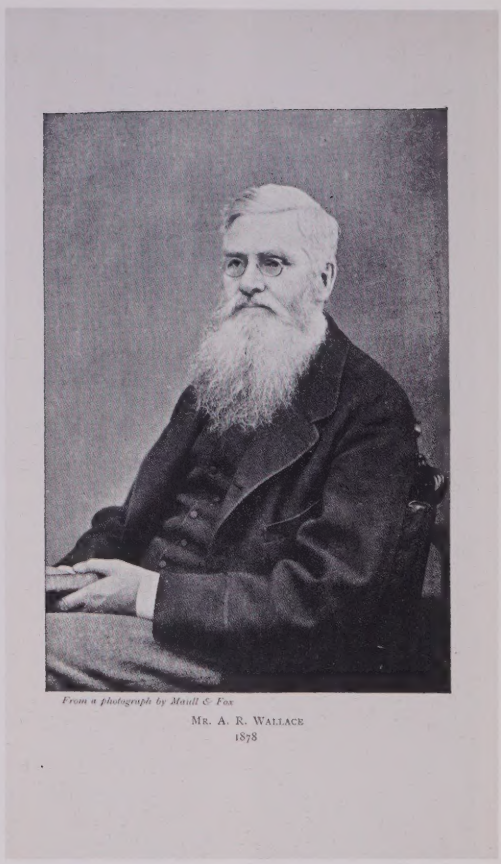
2. An abstract of a private letter addressed to Professor Asa Gray, of Boston, U.S., in October 1857, by Mr. Darwin, in which

* This MS. work was never intended for publication, and therefore was not written with care.—C. D. 1858.

Selection' was read to the Society by Lyell and Hooker. It consisted of three parts: 'Extract From an Unpublished Work on Species', 'Abstract of a Letter from C. Darwin Esq. to Prof. Asa Gray ... September 5th 1857', and Wallace's 'On the Tendency of Varieties to Depart Indefinitely from the Original Type'. Darwin was not present at the meeting as his youngest son had just died from scarlet fever. There was apparently little discussion of the



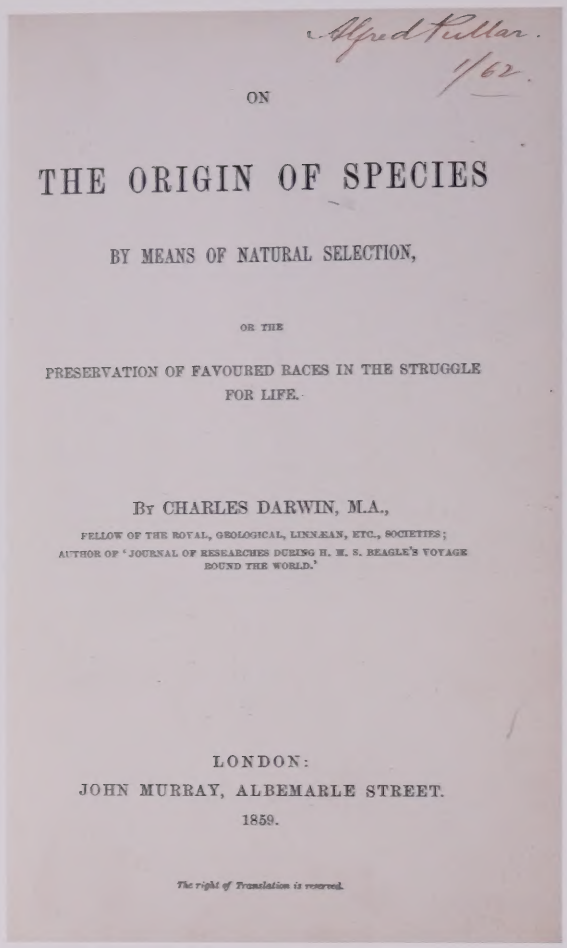
Charles Darwin.
Ætat 45.



From a photograph by Maull & Fox

MR. A. R. WALLACE
1878

momentous announcement among the members. The papers were published in August 1858 in the *Journal of the Proceedings of the Linnean Society of London*, Vol. III, No. 9, pages, 45-62 and an offprint was issued, eight copies of which were sent to Wallace, who was still in Malaysia.



Alfred Fuller.
1/62.

ON

THE ORIGIN OF SPECIES

BY MEANS OF NATURAL SELECTION,

OR THE

PRESERVATION OF FAVOURED RACES IN THE STRUGGLE FOR LIFE.

By CHARLES DARWIN, M.A.,

FELLOW OF THE ROYAL, GEOLOGICAL, LINNÆAN, ETC., SOCIETIES;
AUTHOR OF 'JOURNAL OF RESEARCHES DURING H. M. S. BEAGLE'S VOYAGE ROUND THE WORLD.'

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1859.

The right of Translation is reserved.

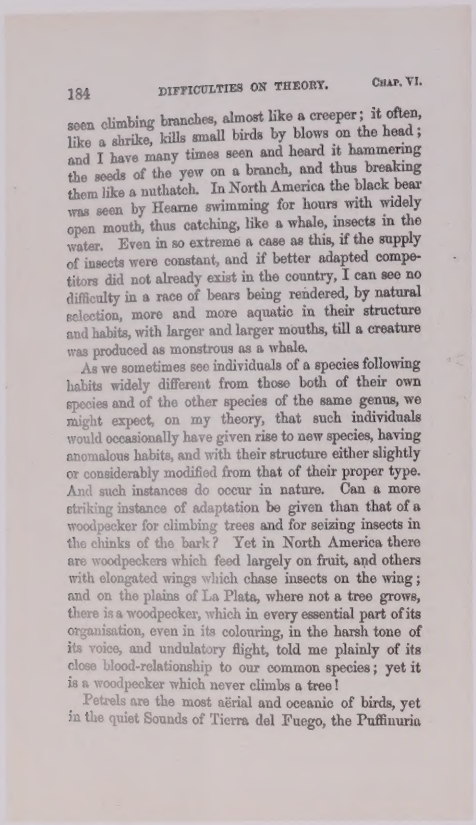
On the Origin of Species

There was now considerable pressure on Darwin to write and publish as quickly as possible a complete statement of his theory of natural selection and he set to work on it on 20 July 1858 while on holiday at Sandown on the Isle of Wight. He still thought of it as an 'abstract', which could be published in the *Journal of the Proceedings of the Linnean Society*, but by the winter it became clear that a substantial book would be required. The completed manuscript was accepted for publication by John Murray in April 1859. By 14 June Darwin was reading proofs, on which he made extensive corrections, and the 'second revises', held by the Honeyman Collection in Lehigh University, are dated and

initialed from 16 July to 30 September, with the final date of 8 October appearing on the title page. One of the more dramatic manuscript additions to those proofs occurs on the title page, where the word 'On" was added to the title. A manuscript title page which he sent to Lyell (now at the American Philosophical Society) read 'An Abstract of an Essay on the Origin of Species and Varieties Through Natural Selection' and was shown to John Murray who thought it was too long. *On the Origin of Species by Means of Natural Selection, or The Preservation of Favoured Races in the Struggle for Life* (an even longer title) was published on 24 November 1859 and Darwin recorded in his diary '1250 copies printed. The first edition was published on November 24th, and all copies sold first day'. What this statement really meant was that all the 1170 copies available for sale, after author, copyright deposit, and review copies had been deducted, were taken up by the retail book trade at Murray's autumn sale. Several presentation copies survive, all inscribed 'From the Author' by one of Murray's clerks; no copy is known to have been inscribed by Darwin himself. For a difficult scientific work *Origin* proved very popular. It was widely reviewed, often critically, but received a very favourable unsigned review in *The Times* on 26 December. On 28 December Darwin wrote to Huxley, 'Certainly I should have said that there was only one man in England ... who could have written this Essay & that you were the man'. Thus Huxley became 'Darwin's bull-dog'. When something of the implications of the theory of natural selection came to be understood, especially that it could be universally applied to humans as well as plants and animals, the fierce debates began which have continued for 150 years. Humans were placed in a relationship to all other living things that shook traditional scientific and theological beliefs to their very foundations.

Michael Wilcox binding
Richard Landon Collection

The type from which the first edition of *Origin* was printed was kept standing so that additions and corrections for each subsequent edition could be easily made; it was not completely reset until the sixth edition of 1872. The printers considered each new edition, and even each separate printing, as a working revise and only reset as much as was necessary to incorporate the revisions. Thus the text, for the first thirteen years of its existence, was in a state of almost continual revision. Immediately after publication Darwin began to revise and recorded in his diary on 14 December, 'I have been busy in getting a reprint (with a very few

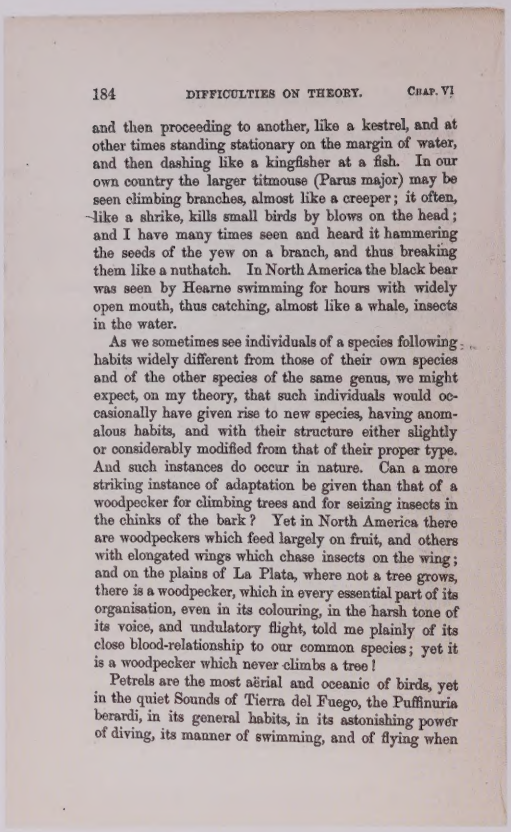


184 DIFFICULTIES ON THEORY. CHAP. VI.

seen climbing branches, almost like a creeper; it often, like a shrike, kills small birds by blows on the head; and I have many times seen and heard it hammering the seeds of the yew on a branch, and thus breaking them like a nuthatch. In North America the black bear was seen by Hearne swimming for hours with widely open mouth, thus catching, like a whale, insects in the water. Even in so extreme a case as this, if the supply of insects were constant, and if better adapted competitors did not already exist in the country, I can see no difficulty in a race of bears being rendered, by natural selection, more and more aquatic in their structure and habits, with larger and larger mouths, till a creature was produced as monstrous as a whale.

As we sometimes see individuals of a species following habits widely different from those both of their own species and of the other species of the same genus, we might expect, on my theory, that such individuals would occasionally have given rise to new species, having anomalous habits, and with their structure either slightly or considerably modified from that of their proper type. And such instances do occur in nature. Can a more striking instance of adaptation be given than that of a woodpecker for climbing trees and for seizing insects in the chinks of the bark? Yet in North America there are woodpeckers which feed largely on fruit, and others with elongated wings which chase insects on the wing; and on the plains of La Plata, where not a tree grows, there is a woodpecker, which in every essential part of its organisation, even in its colouring, in the harsh tone of its voice, and undulatory flight, told me plainly of its close blood-relationship to our common species; yet it is a woodpecker which never climbs a tree!

Petrels are the most aërial and oceanic of birds, yet in the quiet Sounds of Tierra del Fuego, the Puffinuria



184 DIFFICULTIES ON THEORY. CHAP. VI

and then proceeding to another, like a kestrel, and at other times standing stationary on the margin of water, and then dashing like a kingfisher at a fish. In our own country the larger titmouse (Parus major) may be seen climbing branches, almost like a creeper; it often, like a shrike, kills small birds by blows on the head; and I have many times seen and heard it hammering the seeds of the yew on a branch, and thus breaking them like a nuthatch. In North America the black bear was seen by Hearne swimming for hours with widely open mouth, thus catching, almost like a whale, insects in the water.

As we sometimes see individuals of a species following habits widely different from those of their own species and of the other species of the same genus, we might expect, on my theory, that such individuals would occasionally have given rise to new species, having anomalous habits, and with their structure either slightly or considerably modified from that of their proper type. And such instances do occur in nature. Can a more striking instance of adaptation be given than that of a woodpecker for climbing trees and for seizing insects in the chinks of the bark? Yet in North America there are woodpeckers which feed largely on fruit, and others with elongated wings which chase insects on the wing; and on the plains of La Plata, where not a tree grows, there is a woodpecker, which in every essential part of its organisation, even in its colouring, in the harsh tone of its voice, and undulatory flight, told me plainly of its close blood-relationship to our common species; yet it is a woodpecker which never climbs a tree!

Petrels are the most aërial and oceanic of birds, yet in the quiet Sounds of Tierra del Fuego, the Puffinuria berardi, in its general habits, in its astonishing power of diving, its manner of swimming, and of flying when

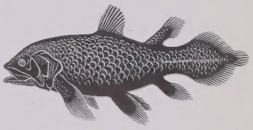
'whale-bear story' 1st ed.
'whale-bear story' 2nd ed.

corrections) through the press ... Murray is now printing 3000 copies.' It was advertised as being ready for sale on Christmas Eve in *The Times* and was published on 7 January, with 'Fifth Thousand' and the date 1860 on its title page. Darwin's 'very few corrections' amounted to nine sentences dropped; 483 rewritten; and thirty added, with changes made in every chapter. There exists at least one copy with mixed sheets of the first and second editions, and an 1859 title leaf, which is held by the Fisher Library. It contains the truncated version of the 'whale-bear story' on page 184, a revision Darwin later regretted. The fifth edition of 1869 was the most extensively revised, with 178 sentences dropped, 1770 sentences rewritten and 227 added between it and the fourth edition of 1866. Small changes were even made after 1872 and the 'Eighteenth Thousand' of 1876 constitutes the final text as he left it. By then about 7500 changes had been made since 1859. The third edition contained 'An Historical Sketch of the Recent Progress of opinion on the Origin of Species' which was written by Darwin to satisfy complaints that he had not sufficiently

acknowledged his predecessors in the general theories of evolution. The authors cited ranged from Lamarck to Herbert Spencer and included William C. Wells and Patrick Matthew, but Darwin did not say that any of them had any particular influence on his work.

The first American edition of *Origin* was published in January 1860 by Appleton which became Darwin's normal publisher in the United States. There were four separate printings in 1860, the last of which contains a supplement of seven pages and notes by Darwin not included in the second English edition. All four, however, have the full version of the whale-bear story. *Origin* was translated into eleven languages during his lifetime and many others since. The first German edition (1860) was by Heinrich Georg Bronn, who edited some of the text of which he did not approve. Julius Victor Carus revised it in 1862 and was solely responsible for the translation of the third edition of 1867. Carus went on to translate twelve other books by Darwin and thus was very influential in the positive reception of Darwin's writings in Germany. The first French translation was published by Clémence-August Royer in 1862, who added her own footnotes. Darwin described her to Asa Gray as 'one of the cleverest and oddest women in Europe'. Although Darwin found the third French translation, by Édmond Barbier in 1876, much more satisfactory, his theories were not enthusiastically received by the French scientific community.

Fertilisation of Orchids

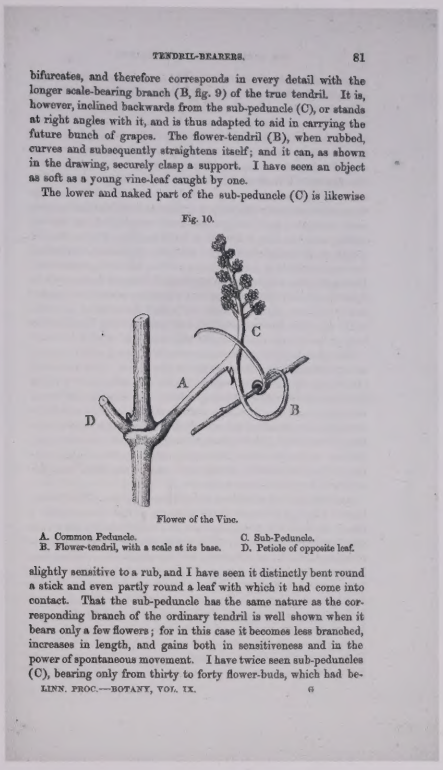


Because Darwin considered *Origin* to be an 'abstract' of his 'big book' he had an immense amount of material left over after 1859 in the form of notes and memoranda. He also continued to do research and to add to the evidence supporting his theory. The first fruit of this endeavour was published in 1862, as *On the Various Contrivances by which British and Foreign Orchids are Fertilised by Insects, and on the Good Effects of Intercrossing*, and was concerned with the relationships between the sexual structures of orchids and the insects which fertilize them. He was able to demonstrate that natural selection had determined their evolution. He wrote to John Murray in September 1861, 'I think this little volume will do good to the "Origin" as it will show that I have worked hard at details'. It was published on 15 May 1862 and

though much praised by botanists, it did not sell very briskly. The book was bound in plum cloth with a gilt orchid on the front cover, the only Murray edition of Darwin between 1859 and 1910 not to be bound in green cloth. A new edition was not called for until 1877, when the title was altered to read *The Various Contrivances by which Orchids are Fertilised by Insects*. All subsequent reprints are taken from the stereotype plates of this revised edition. German and French editions were published in 1862 and 1870 respectively.

Climbing Plants

The second book of specialized evidence of evolution by natural selection, *On the Movements and Habits of Climbing Plants*, was first published in Vol. IX of the *Journal of the Proceedings of the Linnean Society of London*, where it occupies pages 1-118 of numbers 33 and 34. At the same time an offprint was produced for commercial sale and another offprint for Darwin's own use. In 1875 a second edition, extensively revised and enlarged, was



TENDRIL-BEARERS. 81

bifurcates, and therefore corresponds in every detail with the longer scale-bearing branch (B, fig. 9) of the true tendril. It is, however, inclined backwards from the sub-peduncle (C), or stands at right angles with it, and is thus adapted to aid in carrying the future bunch of grapes. The flower-tendril (B), when rubbed, curves and subsequently straightens itself; and it can, as shown in the drawing, securely clasp a support. I have seen an object as soft as a young vine-leaf caught by one.

The lower and naked part of the sub-peduncle (C) is likewise

Fig. 10.

Flower of the Vine.

A. Common Peduncle. C. Sub-Peduncle.
B. Flower-tendril, with a scale at its base. D. Petiole of opposite leaf.

slightly sensitive to a rub, and I have seen it distinctly bent round a stick and even partly round a leaf with which it had come into contact. That the sub-peduncle has the same nature as the corresponding branch of the ordinary tendril is well shown when it bears only a few flowers; for in this case it becomes less branched, increases in length, and gains both in sensitiveness and in the power of spontaneous movement. I have twice seen sub-peduncles (C), bearing only from thirty to forty flower-buds, which had be-

LINN. PROC.—BOTANY, VOL. IX. 6

published by Murray, and the 1882 'Third Thousand' added an appendix and remained the final text. The thirteen woodcuts in the text were executed by Darwin's son George, then aged twenty, who became the Professor of Astronomy and Experimental Philosophy at Cambridge. Darwin studied these plants closely, especially the effect of light on the mechanism of bending in a revolving plane. He also wished to demonstrate the common descent of plants with the properties of climbing. Murray kept the book in print until 1937, the last Darwin book on its list.

Variation Under Domestication

In 1860 Darwin began to write his longest single work, *The Variation of Animals and Plants Under Domestication*, the only section of his 'big book' to be published in his lifetime. It took him until March 1867 to complete the manuscript which represented the first two chapters of the intended whole. It largely contained detailed facts concerning artificial selection based on his own experiments, his extensive correspondence with breeders of

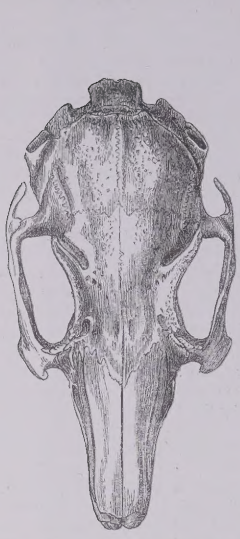


Fig. 6.—Skull of Wild Rabbit, of natural size.

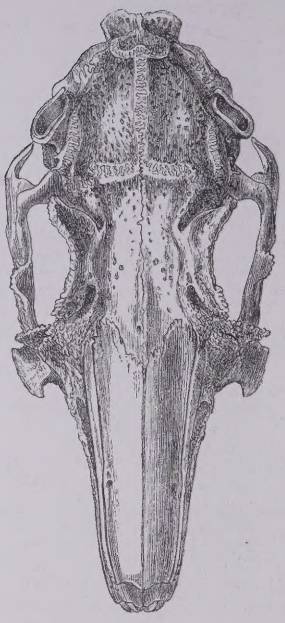


Fig. 7.—Skull of large Lop-eared Rabbit, of natural size.

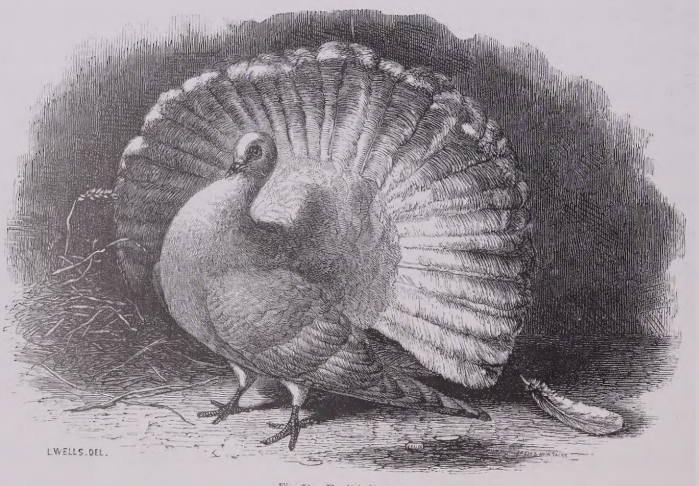


Fig. 21.—English Fantail

domestic animals and plants, as well as a discussion of the evidence and its meaning for evolutionary theories. This was to be followed by another section on natural selection, but remained in note form until it was published in 1975. The book also contained Darwin's provisional theory of pangenesis, an attempt to explain hereditary resemblance and the inheritance of acquired characteristics as well as other diverse phenomena, such as the effects of use and disuse, variation, graft-hybrids, hybridization, atavism, regeneration, reproduction, and embryonic development. He justified his use of hypotheses, already attacked by critics of *Origin*, by quoting William Whewell's statement that 'hypotheses may often be of service to science, when they involve a certain portion of incompleteness, and even of error'. His hypothesis of pangenesis could not be proven. It was not until 1900, when the discoveries of Gregor Mendel (1822-1884), totally ignored for thirty-five years, were 're-discovered' by de Vries and others, that mutation was understood, and some of Darwin's problems could be solved. *Variation* was published in two volumes in January 1868. There were two issues, with a few textual differences, one of 1500 copies and the other of 1250 copies. The first American edition was also published in 1868, by Orange, Judd and Co., and not by Appleton as was usual. The text was extensively altered for the second edition of 1875 which remained the standard, and subsequent reprints were taken from stereotype plates. Part of the Russian translation of 1867-1868 curiously preceded the first English edition as Darwin had sent corrected proofs to the translator, V.O. Kovalevskii, who managed to issue the first four parts in 1867. Both French and German editions appeared in 1868.

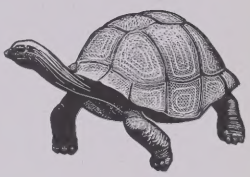
Descent of Man

Although another volume of accumulated evidence was originally intended to follow *Variation of Animals and Plants*, Darwin became so tired of the subject while waiting for it to be published that he turned, for relaxation he claimed, to the composition of *The Descent of Man, and Selection in Relation to Sex*. It presented the logical outcome of his theory of evolution; its direct application to mankind. In *Origin* he had skirted the question of man by merely mentioning that, through his theories, 'light will be thrown on the origin of man and his history' and, although *Descent* roused much controversy, it was not as strident as that

Charles H. Bennett,
Character Sketches. 1872

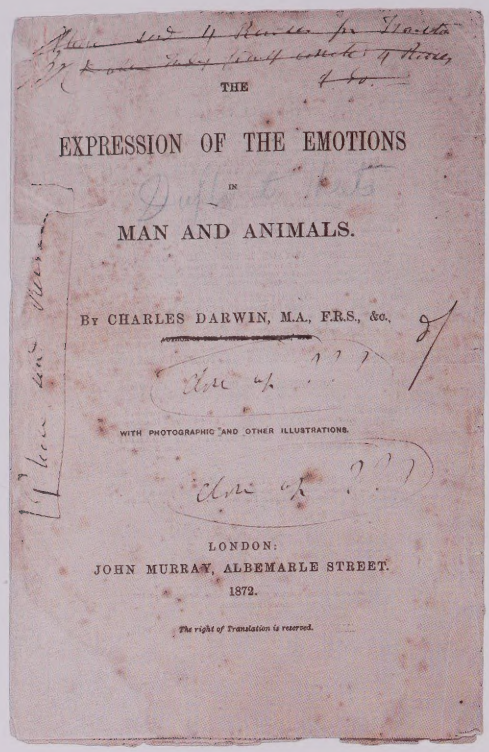
surrounding the earlier book. He did, however, in the preface to the second edition, write of 'the fiery ordeal through which this book has passed', even though it had been preceded by Huxley's *Man's Place in Nature* in 1862. As early as 1837 Darwin had recorded in his *Notebooks on Transmutation of Species* that 'man in his arrogance thinks himself a great work worthy the interposition of a deity. More humble and I believe truer to consider him created from animals.' The first edition of *Descent* was published 24 February 1871 in two volumes by John Murray. Once again there were two issues which appear to be exactly the same externally, but which contain important textual differences, on pages 297-299 in volume I and pages 161 and 237 in volume II. The first issue of 2500 copies used errata slips to make the corrections and the text was reset for the 'second issue' of 2000 copies, published

in March. The first American edition, published by Appleton in 1871, was based on the first issue of the English edition and thus contains the faulty text for volume I, but the revised text for volume II. Two further editions, called the seventh and eighth thousand, both with textual changes, were published in 1871. The 'Tenth Thousand', called the 'second edition', appeared in 1874 in one volume, extensively revised, and containing a note by Huxley on the brains of men and apes. The definitive text was the 'Twelfth Thousand' of 1877, and reprints of it reached the thirty-fifth thousand by 1899. Almost three-quarters of the work was concerned with sexual selection, which had been mentioned by Darwin in *Origin* as being another agency through which evolution could be explained. The development of special structures relating to the mating of animals, such as the peacock's train and the deer's antlers, were explained by the hypothesis of sexual selection. He also dealt with sexual selection in man. The many examples cited, ranging through the whole animal kingdom from molluscs to man, accounted for the length of the text, but the conclusion was simple: 'man and all other vertebrate animals have been constructed on the same general model'. The argument was elegant and eloquent and firmly established Darwin's theories for the mechanisms of evolution. The book's influence was widespread, with translations into Danish, Dutch, French, German, Italian, Polish, Russian, and Swedish, all before 1875, and many others since. *Descent* became a best-seller for a scientific book.



Expression of the Emotions

With *The Expression of the Emotions in Man and Animals* Darwin shifted the focus of his studies into an area which was a combination of the physiological and psychological in which his research consisted of close observation of his children and animals, supported by wide reading and consultation with professional colleagues. It was, however, intimately linked to his evolutionary work since its impetus was an attempt to refute the concept, maintained by Sir Charles Bell (1774-1842) in his 1806 *Anatomy and Philosophy of Expression*, that the facial muscles of expression in man were a special endowment. Through his observations and reading, especially Guillaume Duchenne's 1862 *Mécanisme de la physionomie humaine* with its suite of photographs, Darwin was able to formulate three principles underlying the expression of



THE

EXPRESSION OF THE EMOTIONS

IN

MAN AND ANIMALS.

By CHARLES DARWIN, M.A., F.R.S., &c.

WITH PHOTOGRAPHIC AND OTHER ILLUSTRATIONS.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1872.

The right of Translation is reserved.

Corrected proof in Darwin's hand

emotions. First, certain movements and actions indicate a particular state of mind and will be reproduced when this state of mind is induced even though they no longer have any function. An example of this is a man snarling, despite the fact that he no longer has large canine teeth with which to follow through the threat. The antithesis of this principle constitutes the second principle. When the state of mind is reversed the movements or actions will also be reversed. The third principle states that certain reflex actions depend on the structure of the nervous system. Darwin was so impressed by Duchenne's photographs that he obtained permission to use some of them which appeared as seven heliotype photographic plates, the first use of this process in a book. *Expression* also was illustrated with several wood engravings, including some very appealing images of dogs and cats. The first edition was published on 26 November 1872 in an edition of seven thousand copies, a large press-run for a Darwin first. As was often the case, there were two issues, with minor textual variations and the plates numbered in either arabic or roman. A 'Tenth Thousand' appeared in 1873, but a new edition was not required until 1890, when it was edited by his son Francis who incorpo-

Heliotype plates from
Expression of the Emotions

rated notes accumulated by Darwin between 1872 and 1882. The first American edition was published by Appleton in 1872 (although the title page is dated 1873) and was translated into the major European languages. The proofs of the first edition, called '1st revises', now in the Fisher Library collection, were extensively

58 THE PRINCIPLE OF ANTITHESIS. CHAP. II.
CHAP. II. THE PRINCIPLE OF ANTITHESIS. 59
Fig. 9. Cat, savage, and prepared to fight. Drawn from life by Mr. Wood.
Fig. 10. Cat in an affectionate frame of mind. By Mr. Wood.

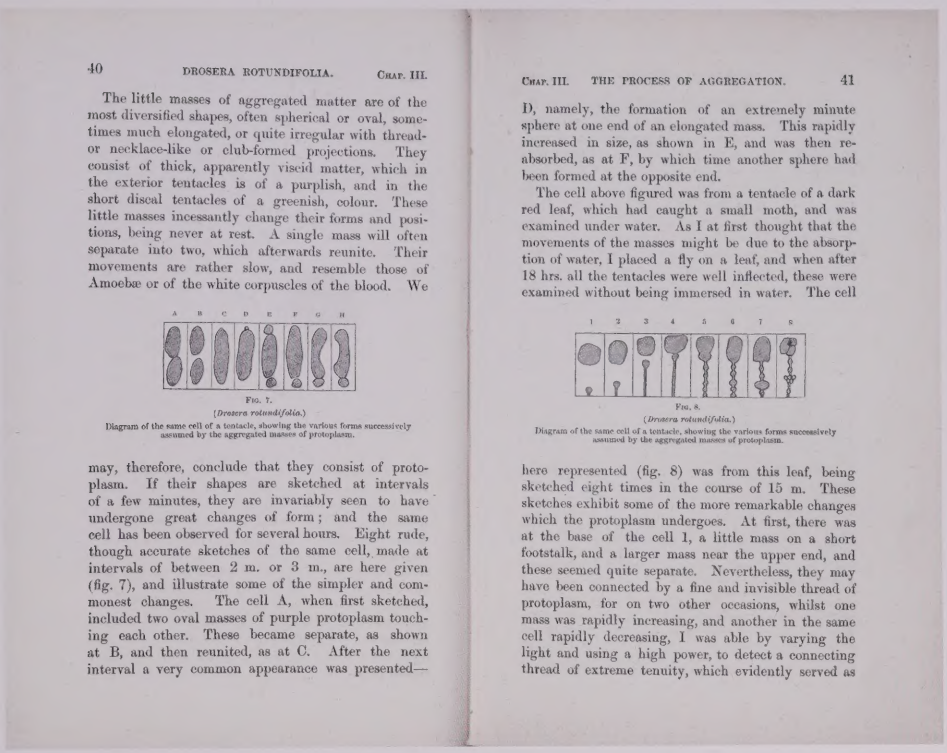
Woodcuts from *Expression of the Emotions*

corrected by Darwin, the separate gatherings being dated successively from 19 July to 25 September 1872. The most dramatic change occurred in the caption title at the beginning of the text where the phrase 'the Lower' was removed from the title and humans and animals were placed on an equal footing.

Insectivorous Plants

After *Expression* Darwin again turned to the study of plants. He had previously noticed with surprise the large number of insects captured by the common sundew (Drosera) in Sussex and so began to experiment with these curious insect-eating plants. He tested the plants' reactions to such diverse substances as raw meat and poison from a live adder. He discovered that the impulse which caused the tentacles to bend was transmitted through the cellular tissue of the leaf, and calculated that the plants were seventy-eight times more sensitive than the swing balances of his own time, being able to distinguish a piece of human hair weighing 0.0008 milligrams.

The results of these experiments, which he related to his other



40 DROSERA ROTUNDIFOLIA. CHAP. III.

The little masses of aggregated matter are of the most diversified shapes, often spherical or oval, sometimes much elongated, or quite irregular with thread- or necklace-like or club-formed projections. They consist of thick, apparently viscid matter, which in the exterior tentacles is of a purplish, and in the short discal tentacles of a greenish, colour. These little masses incessantly change their forms and positions, being never at rest. A single mass will often separate into two, which afterwards reunite. Their movements are rather slow, and resemble those of Amoebæ or of the white corpuscles of the blood. We

A B C D E F G H

FIG. 7.
(*Drosera rotundifolia.*)
Diagram of the same cell of a tentacle, showing the various forms successively assumed by the aggregated masses of protoplasm.

may, therefore, conclude that they consist of protoplasm. If their shapes are sketched at intervals of a few minutes, they are invariably seen to have undergone great changes of form; and the same cell has been observed for several hours. Eight rude, though accurate sketches of the same cell, made at intervals of between 2 m. or 3 m., are here given (fig. 7), and illustrate some of the simpler and commonest changes. The cell A, when first sketched, included two oval masses of purple protoplasm touching each other. These became separate, as shown at B, and then reunited, as at C. After the next interval a very common appearance was presented—

CHAP. III. THE PROCESS OF AGGREGATION. 41

D, namely, the formation of an extremely minute sphere at one end of an elongated mass. This rapidly increased in size, as shown in E, and was then reabsorbed, as at F, by which time another sphere had been formed at the opposite end.

The cell above figured was from a tentacle of a dark red leaf, which had caught a small moth, and was examined under water. As I at first thought that the movements of the masses might be due to the absorption of water, I placed a fly on a leaf, and when after 18 hrs. all the tentacles were well inflected, these were examined without being immersed in water. The cell

1 2 3 4 5 6 7 8

FIG. 8.
(*Drosera rotundifolia.*)
Diagram of the same cell of a tentacle, showing the various forms successively assumed by the aggregated masses of protoplasm.

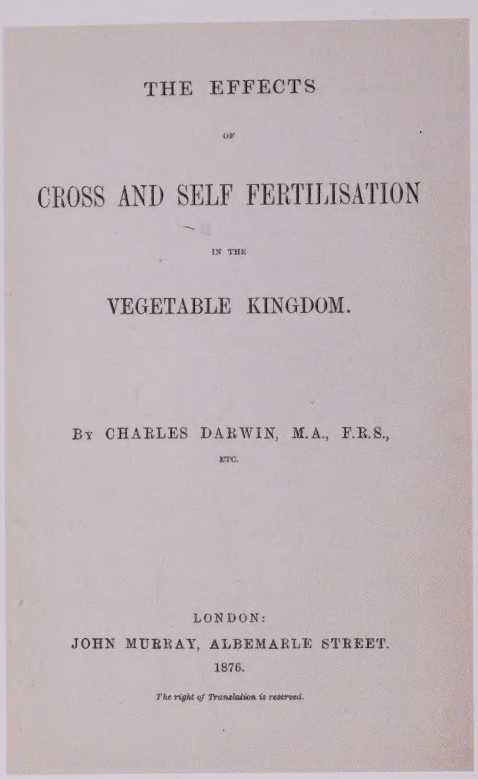
here represented (fig. 8) was from this leaf, being sketched eight times in the course of 15 m. These sketches exhibit some of the more remarkable changes which the protoplasm undergoes. At first, there was at the base of the cell 1, a little mass on a short footstalk, and a larger mass near the upper end, and these seemed quite separate. Nevertheless, they may have been connected by a fine and invisible thread of protoplasm, for on two other occasions, whilst one mass was rapidly increasing, and another in the same cell rapidly decreasing, I was able by varying the light and using a high power, to detect a connecting thread of extreme tenuity, which evidently served as

Charles Darwin illustrations from *Insectivorous Plants*

evolutionary works through a study of the adaptations of the plants to impoverished conditions, were published as *Insectivorous Plants* on 2 July 1875 in an edition of three thousand copies. It was well illustrated with thirty text woodcuts by George and Francis Darwin, except figures 7 and 8, which were by the author, even though he was not a very competent draughtsman. Francis Darwin revised the work and published a second edition in 1888, which included some corrections by Charles Darwin taken from his marked-up copy of the first. There were French, German, Italian, and Russian editions in his lifetime and several American printings by Appleton.

Cross and Self Fertilisation

The Effects of Cross and Self Fertilisation in the Vegetable Kingdom continued Darwin's studies in the field of botany. It was concerned with the nature of mechanisms favouring cross fertilisation and he considered it a complement to *Fertilisation of*



THE EFFECTS

OF

CROSS AND SELF FERTILISATION

IN THE

VEGETABLE KINGDOM.

By CHARLES DARWIN, M.A., F.R.S.,

ETC.

LONDON:

JOHN MURRAY, ALBEMARLE STREET.

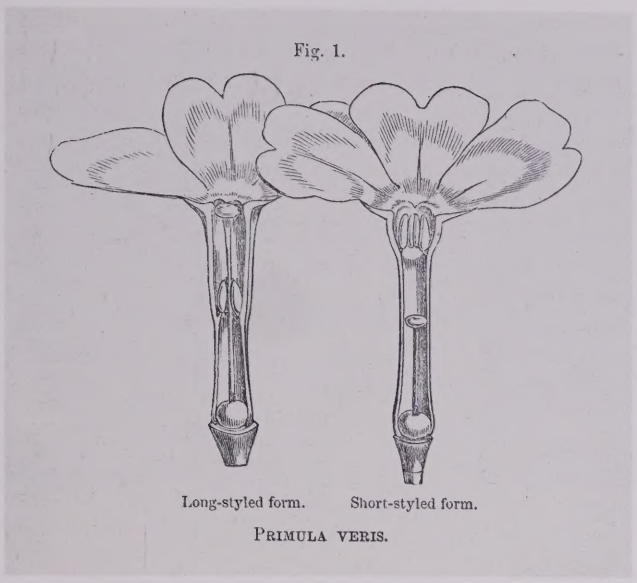
1876.

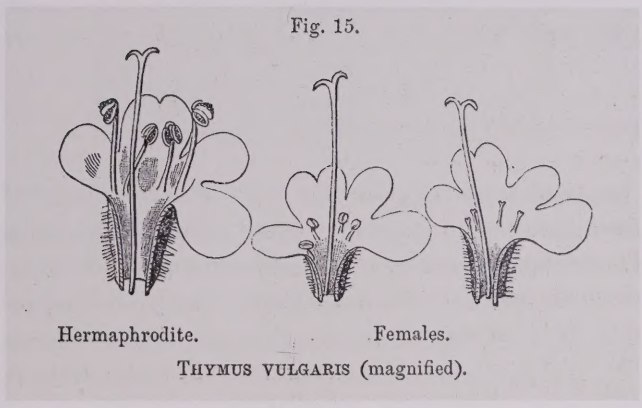
The right of Translation is reserved.

Orchids. He conducted experiments on fifty-seven species of plants over a period of twelve years and concluded that cross pollination produced more numerous, larger, and more vigorous plants than self pollination. The first edition was published on 10 November 1876 in a smaller edition than usual and the second edition of 1878 was not revised much at all. The proofs that are in the Fisher Library collection, dated 14 September to 13 October 1876 were lightly revised, with some of the annotations in the hand of Francis Darwin.

Different Forms of Flowers

A number of Darwin's observations and experiments on flowers of the same species differing in structure or in function were published in the *Journal of the Linnean Society of London* and other periodicals. In 1877 he brought together, with extensions and revisions, the whole series and published it as *The Different Forms of Flowers on Plants of the Same Species*. It was a complex text, with many detailed technical aspects, which did not appeal to a wide

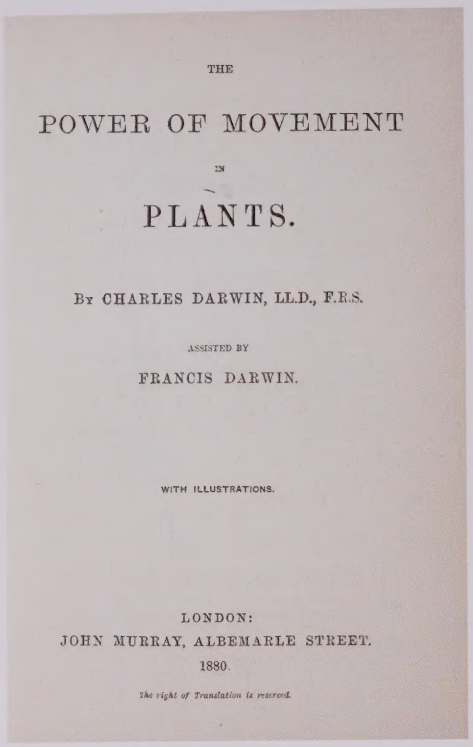




audience and only about two thousand copies were sold during Darwin's lifetime. A second edition, to which he added a new preface listing recent studies in the same subject, was published in 1880 and Francis Darwin added another 'survey of recent literature' to the 'Third Thousand' of 1884.

Power of Movement in Plants

The Power of Movement in Plants, published in 1880, was the result of five years of experiments carried out by Darwin with the assistance of his son Francis. He saw it as an extension of *Climbing Plants* and attempted to demonstrate that the mechanisms used



THE

POWER OF MOVEMENT

IN

PLANTS.

By CHARLES DARWIN, LL.D., F.R.S.

ASSISTED BY

FRANCIS DARWIN.

WITH ILLUSTRATIONS.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1880.

The right of Translation is reserved.

by the twining plants were applicable to flowering plants in general. It was illustrated with 196 text woodcuts, but again was too technical for a wide general audience and sold fewer copies that any other of Darwin's major works. The 'Third Thousand' of 1882 was the last English edition, although Appleton continued to issue it in the United States up to 1900. The proofs in the Fisher Library collection were corrected from 8 July to 2 October 1880.

Vegetable Mould and Worms

Darwin's last major work was one of his most successful, but somewhat outside his primary research interests. The subject of mould, however, had interested him since the time of the *Beagle* voyage and he had published papers on it in 1838 and 1840. He had also studied the actions of earthworms at Maer Hall, the home of the Wedgwoods. In 1881 he published *The Formation of Vegetable Mould, Through the Action of Worms, with Observations on their Habits*, the results of a project which focused on the famous 'worm stone', a round stone set in the ground of his garden by Darwin to measure the movement of soil by worms. A recon-

Fig. 2.

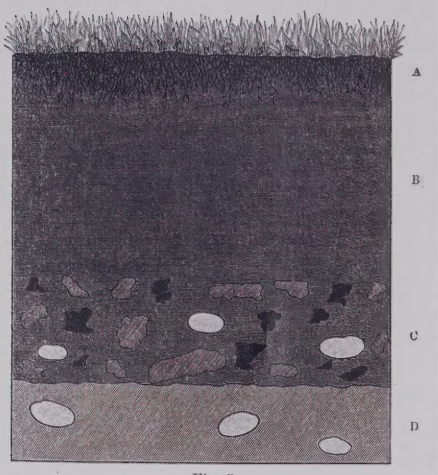
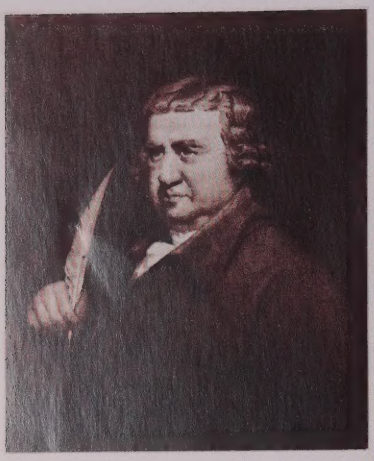


Fig. 5.

struction of it by his son Horace is still to be seen at Down House. He was able to demonstrate that the castings of worms and the part played by them in the aeration of soil was a major factor in the formation of mould which is essential for plant life. His book was a pioneering work in the study of ecology and proved to be unexpectedly popular. There were five separate printings all published in 1881, with minor corrections to the text. More substantial revisions were made for the sixth thousand of 1882. For the seventh thousand of 1882 Francis Darwin took over the corrections and the book reached its thirteenth thousand in 1904. Appleton published the first American edition in 1882, printed from stereotype plates of the first English edition, some of them issued as Vol. XXXVII of the 'International Scientific Series'. It was translated into Armenian, French, German, Italian, and Russian.

Erasmus Darwin

In February 1879 Ernst Krause published a short biography of Erasmus Darwin in the periodical *Kosmos*. In the same year W.S. Dallas translated it into English and Murray published it as a separate work with a 'Preliminary Note' by Darwin which was actually longer than Krause's work. Krause's text had, moreover, been slightly altered to include a reference to Samuel Butler's *Life and Habit*, published in 1878 (actually 4 December 1877, Butler's



ERASMUS DARWIN.

FROM A PICTURE BY WRIGHT OF DERBY.

ERASMUS DARWIN.

By ERNST KRAUSE.

TRANSLATED FROM THE GERMAN BY W. S. DALLAS.

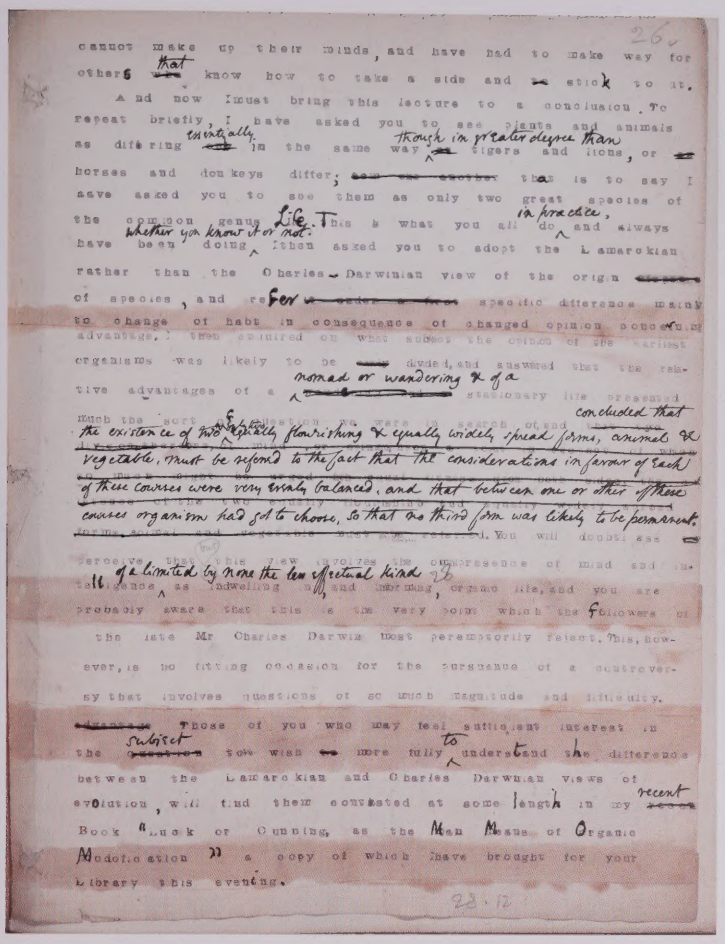
WITH A PRELIMINARY NOTICE

By CHARLES DARWIN.

PORTRAIT AND WOODCUTS.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1879.

birthday) and a footnote reference to *Evolution, Old and New* (1879) which unduly upset Butler and caused him to launch an acrimonius and sustained attack on Darwin and his theories. Butler's views were essentially Lamarkian and were more fully expressed in *Unconscious Memory* (1880). Darwin never replied directly to these attacks, relying on George Romanes (1848-1894) to mount a defence. Darwin wrote to Romanes in April 1881: 'I am extremely glad that you seem to have silenced Butler and his reviewers. But Mr. Butler will turn up again, if I know the man.' Butler did indeed turn up again and the disputed issues were not finally settled until 1911 when Henry Festing Jones, Butler's friend and biographer, published a pamphlet called *Charles Darwin and Samuel Butler: A Step Towards Reconciliation*, with the approval of Francis Darwin. Both the protagonists were by then, of course, long dead.



Samuel Butler. Corrected typescript of a lecture discussing Darwinism in 1887

Animal Intelligence and Mental Evolution

George John Romanes, a lecturer in biology at University College London and Oxford, was one of the most influential of Darwin's younger colleagues and friends. In 1882 he published a work called *Animal Intelligence* which contained long quotations from *Origin* and *Descent of Man*, as well as a number of extracts from Darwin's notes on behaviour which had been lent to Romanes and appeared in print for the first time. It was in the press at the time of Darwin's death. Romanes also published *Mental Evolution in Animals* in 1883 and it contained, as an appendix what was called a 'Posthumous Essay on Instinct' by Darwin. His contributions to both of these books had been extracted from the second part of the 'big book' on the origin of species, which did not appear in its entirety until 1975.

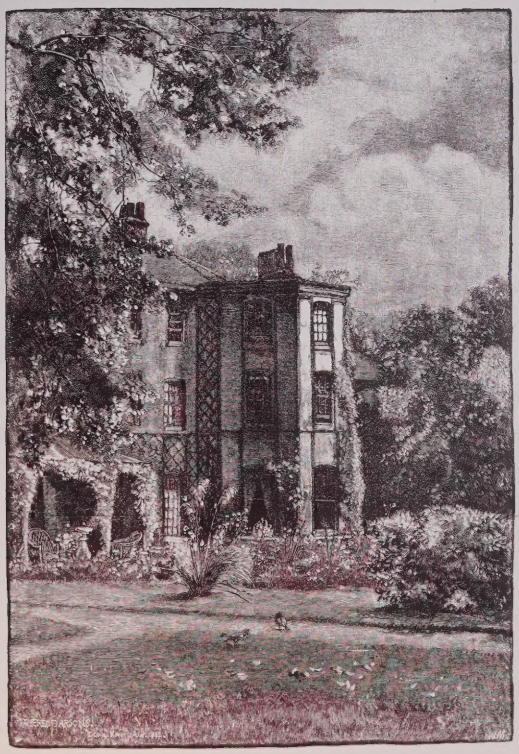
Emma Darwin

Charles Darwin and his sister Catharine

Life and Letters

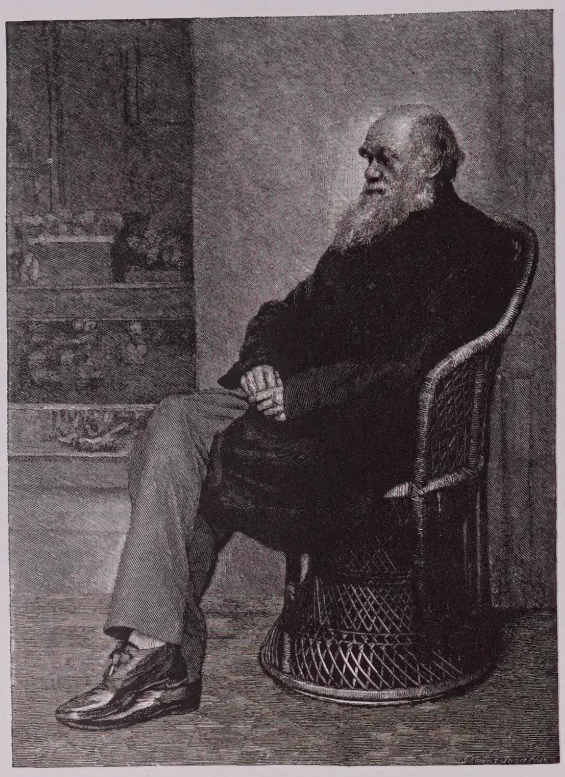
The general public interest in Darwin's life and work, which made his books more popular than those of most scientists, did not, of course, cease with his death. In 1887, his son, Francis, edited a three-volume work called *The Life and Letters of Charles Darwin, Including an Autobiographical Chapter*, published by Murray, which reached its seventh thousand in 1888, slightly revised. It was edited, especially the 'Autobiography', to avoid giving offence to Emma Darwin (1808-1896). The complete *Autobiography* was not published until 1958. An abridged edition, in one volume, called *Charles Darwin: His Life Told in an Autobiographical Chapter, and in a Selected Series of his Published Letters* which contained some text not in the original three-volume work, was produced by Francis Darwin in 1892. *More Letters of Charles Darwin*, edited by Francis Darwin and A.C. Seward in two volumes, appeared in 1903. The following year Francis Darwin's sister, Henrietta E. Litchfield, had 250 copies privately printed of a work called *Emma Darwin, Wife of Charles Darwin; A Century of Family Letters*, in two volumes, which contained his letters to her while they were courting and much else about their family life and Darwin's health. *Emma Darwin* was not actually published

THE STUDY AT DOWN.*



THE HOUSE AT DOWN. FROM A DRAWING BY MR. ALFRED PARSONS. ENGRAVED FOR THE 'CENTURY MAGAZINE,' JANUARY 1883.

To face p. 320, Vol. I.



FROM A PHOTOGRAPH (1874?) BY CAPTAIN L. DARWIN, R.E. ENGRAVED FOR THE 'CENTURY MAGAZINE,' JANUARY 1883.

Frontispiece, Vol. II.

until 1915. *Life and Letters* was translated into twenty-one languages and then into English Braille. Darwin's correspondence was enormous, even by the standards of his time, and *The Correspondence of Charles Darwin*, edited by Frederick Burkhardt and Sydney Smith, began appearing in 1985. Seventeen volumes have been published to date and it is estimated that the completed project will require thirty.

Posthumous Publications

Although Darwin's 'notebooks' and 'journal' remained in manuscript for many years, they were published in the *Bulletin of the British Museum (Natural History), Historical Series* in 1959, 1960-61 and 1963, edited by Sir Gavin de Beer and Lady Nora Barlow. When Francis Darwin was assembling material for *Life and Letters* he did not know that the sketch of his father's evolutionary ideas, written in 1842, had survived. It was discovered in a cupboard under the stairs in Down House in 1896 and was first printed for the delegates attending the Cambridge conference in commemoration of the centenary of Darwin's birth and the fiftieth anniversary of the publication of *Origin* in 1909. Francis Darwin edited it as *The Foundations of The Origin of Species, a Sketch Written in 1842* and in the same year published it, together with the sketch of 1844, as *The Foundations of The Origin of Species: Two Essays Written in 1842 and 1844*. Other works have continued to appear from the voluminous Darwin papers, most importantly R.C. Stauffer's 1975 edition of *Charles Darwin's Natural Selection; Being the Second Part of his Big Species Book Written from 1856 to 1858*, in 1975. Darwin, early in his career, remarked in a letter to John Maurice Herbert (1808-1882), his student friend from Cambridge, that he had 'long discovered that geologists never read each others works, and that the only object in writing a book is a proof of earnestness, and that you do not form your opinions without undergoing labour of some kind'. From the time he returned from the *Beagle* voyage until his death Darwin laboured steadily. His total production was twenty books and three pamphlets and he contributed to eight books and one pamphlet. About 250 of his articles were published by the scientific periodicals and learned societies of his time. Almost every one of his books was published in several editions and almost every edition had textual revisions of significant importance. Most of the editions of the principal works were further subdivided into 'issues', which provided the opportunity for small changes to the text. Darwin's books evolved. Thus a complete collection of his works, which might seem comparatively small when first contemplated, becomes, in fact, quite extensive. When Darwiniana, the works of predecessors, his contemporary supporters and detractors, and the great mass of later works concerning evolution

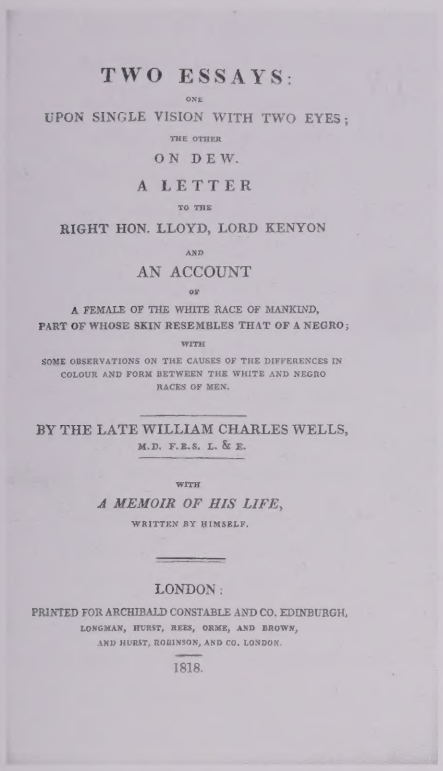
are added, the collection becomes very large indeed. The Fisher holdings, for example, number almost two thousand items, almost half of those being pre-1900.

Precursors and Contemporaries

For the third edition of *Origin of Species* Darwin prepared 'An Historical Sketch of the Progress of Opinion on the Origin of Species, Previously to the Publication of the First Edition of this Work'. It was composed to satisfy complaints that he had not given proper credit to his predecessors for their contributions to general theories of evolution. Darwin acknowledged only those naturalists who had discussed the modification of species, whether he had read and been influenced by their work or not. William Paley, Charles Lyell, and Thomas Malthus had a direct influence on his work, but none of them had discussed transmutation and therefore did not appear in the 'Historical Sketch'.

Another name missing from the 'Historical Sketch' was that of Darwin's grandfather, Erasmus Darwin. In his autobiographical works he claimed that he had not been influenced by the elder Darwin's evolutionary views, either in poetry and prose, but clearly he had closely studied his books, especially *Zoonomia, or, The Laws of Organic Life*, published in 1794. There Erasmus Darwin had expressed his belief that in the struggle for existence organisms had adapted themselves to their environment through the prompting of such natural desires as hunger, lust, and security, and that the resulting changes were then passed down to succeeding generations in a continuous, progressive process. His theory of the generation of living 'filaments' from which all animals and plants evolved must also have been influential.

Darwin did claim that his grandfather's principal distinction was his anticipation of the evolutionist theories of the French biologist, Jean Baptiste Lamarck. Although Lamarck has generally been regarded as the first to discuss the transformation of species, following a passing reference to Aristotle, he was the first writer mentioned in the 'Historical Sketch'. In his *Philosophie zoologique* of 1809 Lamarck wrote of a tendency in nature to perfection and increased complexity, and conceived of living organisms as forming a hierarchy, the higher orders having a greater specialization of organs than the lower. He was also, along with Erasmus Darwin, to recognize the important relationship



TWO ESSAYS:

ONE

UPON SINGLE VISION WITH TWO EYES;

THE OTHER

ON DEW.

A LETTER

TO THE

RIGHT HON. LLOYD, LORD KENYON

AND

AN ACCOUNT

OF

A FEMALE OF THE WHITE RACE OF MANKIND,
PART OF WHOSE SKIN RESEMBLES THAT OF A NEGRO;

WITH

SOME OBSERVATIONS ON THE CAUSES OF THE DIFFERENCES IN COLOUR AND FORM BETWEEN THE WHITE AND NEGRO RACES OF MEN.

BY THE LATE WILLIAM CHARLES WELLS,
M.D. F.R.S. L. & E.

WITH

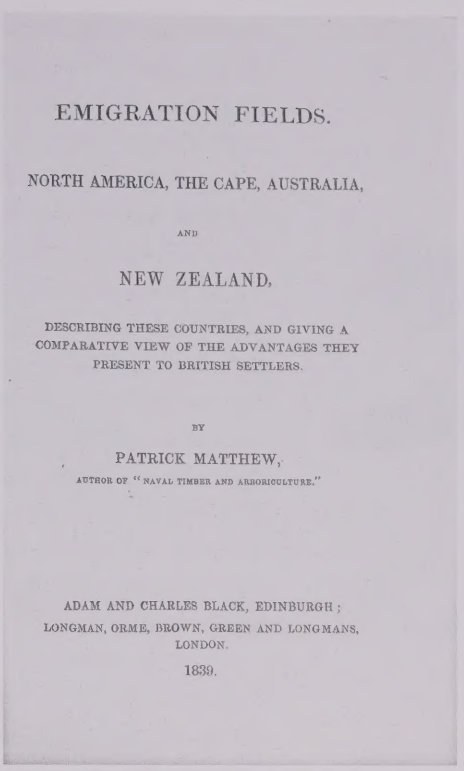
A MEMOIR OF HIS LIFE,

WRITTEN BY HIMSELF.

LONDON:

PRINTED FOR ARCHIBALD CONSTABLE AND CO. EDINBURGH,
LONGMAN, HURST, REES, ORME, AND BROWN,
AND HURST, ROBINSON, AND CO. LONDON.

1818.



EMIGRATION FIELDS.

NORTH AMERICA, THE CAPE, AUSTRALIA,

AND

NEW ZEALAND,

DESCRIBING THESE COUNTRIES, AND GIVING A COMPARATIVE VIEW OF THE ADVANTAGES THEY PRESENT TO BRITISH SETTLERS.

BY

PATRICK MATTHEW,

AUTHOR OF "NAVAL TIMBER AND ARBORICULTURE."

ADAM AND CHARLES BLACK, EDINBURGH;
LONGMAN, ORME, BROWN, GREEN AND LONGMANS, LONDON.

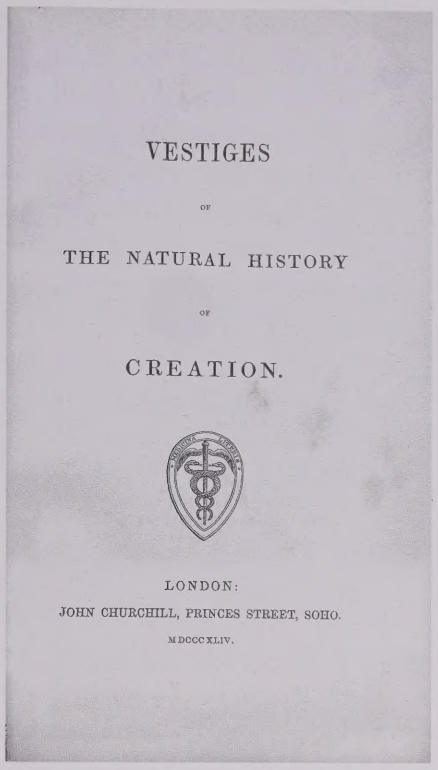
1839.

that existed between organisms and their environment, and believed that changes in the physical environment predetermined the needs of the organism and brought about changes in behaviour and habit which would, by degrees, alter the corporeal structure. Lamarckism was philosophically appealing, especially to people like Samuel Butler, but did not contain any suggestion of natural selection as a mechanism for evolution. However, Darwin's tribute in the 'Historical Sketch' for his 'eminent service of arousing attention to the probability of all change in the organic, as well as in the inorganic world, being the result of law' was an acknowledgement of Lamarck's pioneering influence.

The 'Historical Sketch' contained twenty-one names, some of them completely unknown to Darwin until they were brought to his attention in the wake of the publication of *Origin*. Among these were William Charles Wells (1757-1817) and Patrick Matthew (1790-1874), both mentioned by Darwin as having speculated on the question of natural selection. Wells was an American-born physician who settled in London in 1785. In 1813 he delivered a paper to the Royal Society on a white woman with patchy black discolouration of her skin. His discussion of this

unusual case contained the rudiments of the theory of natural selection, but was not published until 1818 when it was included in his *Two Essays*, together with an essay on binocular vision and his more famous treatise on dew. Patrick Matthew, a writer on political and agricultural subjects, published his statement on the theory of natural selection in 1831, in the appendix to his book, *On Naval Timber and Aboriculture* and made further remarks on it in 1839 in *Emigration Fields*. In 1860 he drew attention to his priority in an article in the *Gardener's Chronicle*, to which Darwin replied, and seems to have advertised himself as the 'discoverer of the principle of natural selection,' which obviously irritated Darwin. In 1865 Darwin wrote to Hooker, 'a Yankee has called my attention to a paper attached to Dr. Wells' famous "Essay on Dew", which was read in 1813 to the Royal Soc., but not printed, in which he applied most distinctly the principle of Natural Selection to the Races of Man. So poor old Patrick Matthew is not the first'.

Darwin admired the work of Geoffrey Saint-Hilaire and acknowledged that he had suspected as early as 1795 'that what we call species are various degenerations of the same type', but this view was not published until 1828 and Saint-Hilaire was very cautious in drawing conclusions from his research. In 1844 a work entitled *Vestiges of the Natural History of Creation* appeared, followed by *Explanations: A Sequel* in 1845; both were published anonymously. Authorship of these books, which created considerable controversy, was not revealed publicly until 1884. They were attributed to Robert Chambers, an Edinburgh publisher and editor of *Chambers' Journal*, and author of a number of historical, literary, and biographical works. In *Vestiges* he advanced a bold statement of evolutionary theory, similar to that of Lamarck, based on the natural law of development. It expressed the idea that higher orders arise from lower ones as a result of an inherent proclivity to progressive development. Chambers' work was widely read, with four editions appearing in seven months and ten during its first decade. Darwin was highly critical of the book, which he dismissed contemptuously in *Origin*, particularly since 'Mr Vestiges', as he called the author, advanced no explanation as to how the dubious progression from lower organisms to higher forms was brought about. Most competent scientists, especially Huxley and Adam Sedgwick, condemned *Vestiges* but it struck a chord with the public and by the time he wrote the 'Historical


VESTIGES

OF

THE NATURAL HISTORY

OF

CREATION.

LONDON:

JOHN CHURCHILL, PRINCES STREET, SOHO.

MDCCCXLIV.

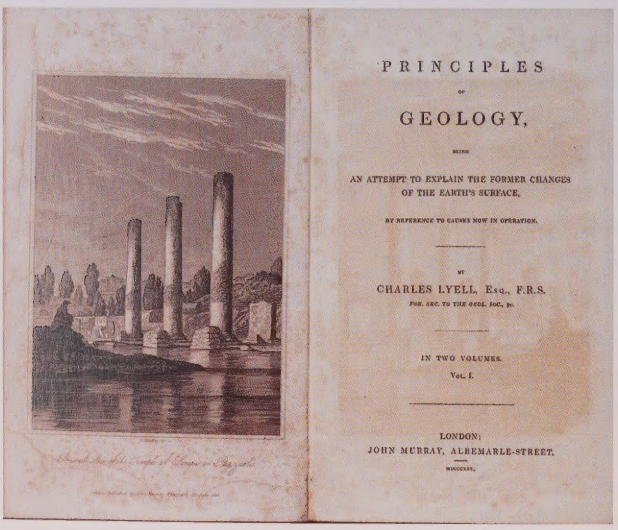
Sketch' Darwin was willing to admit that 'it has done excellent service in this country in calling attention to the subject, in removing prejudice, and in thus preparing the ground for the reception of analogous views'. He was speaking of the 'much improved' tenth edition of 1853. Thus, despite its spurious scientific argument *Vestiges* prepared the informed community for the more serious discussion of Darwin's theory of natural selection.

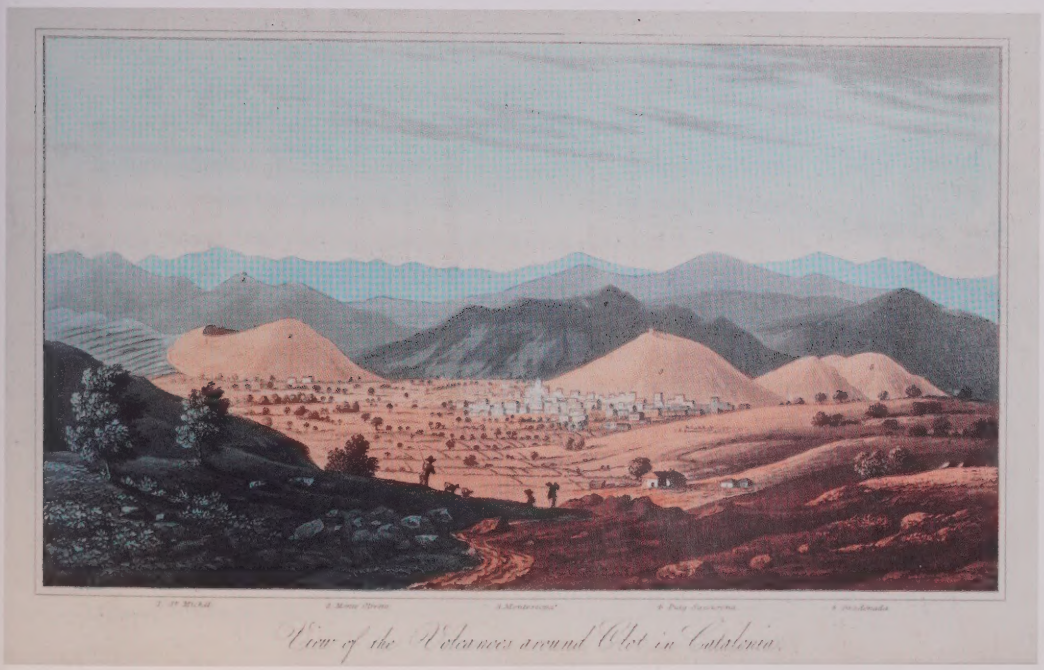
Darwin was introduced to the works of William Paley (1743-1805), a theologian much influenced by Thomas Malthus, while at Cambridge. He was most impressed by *Natural Theology* (1802) which contained the fullest and clearest statement of Paley's teleological argument. According to Paley, there was an order in the universe that bore testimony to a 'grand design' behind creation. He argued against the early evolutionary theories of Buffon and Lamarck and claimed that the various structural adaptations of animals to their environment were the conscious results of divine design. Even though much of *Natural Theology* was lifted from John Ray's *Wisdom of God*, published in 1691, Darwin admired Paley's orderly and logical reasoning and recorded that it gave him 'as much delight as did Euclid'. He also remarked that he had

not, at that time, paid much attention to Paley's premises.

Darwin read Thomas Robert Malthus' *Essay on the Principles of Population* in 1838 'for amusement', as he recalled in his 'Autobiography'. It had been published anonymously in 1798, and the second edition of 1803 had been much revised and enlarged. It was this text in its sixth edition of 1826, that Darwin had read. The famous *Essay* was based on the theory that population grows in a geometrical ratio, while agricultural production increases only arithmetically; thus the rapid increase in population will doom many people to misery and deprivation. Darwin claimed that Malthus's description of the struggle for existence in human society provided him with a key to an understanding of the self-regulating mechanism by which natural selection could operate. By transferring the principle of struggle for existence to the animal and plant kingdoms, Darwin realized that the favourable or 'strong' variations emerging from the struggle would tend to be preserved, resulting in the formation of new species, while unfavourable or 'weak' variations would perish. 'Here, then, I had at last got a theory by which to work', he wrote in his 'Autobiography'. Coincidentally, Wallace also read Malthus and the *Essay* strongly influenced the formation of his theory of natural selection.

One of the books Darwin took with him on the *Beagle* voyage was *Principles of Geology*, the classic work of Charles Lyell, the leading British geologist of his time. It was published between 1830 and 1833 and Darwin's copy of Vol. I was presented to him by Fitz-Roy. It greatly influenced his geological work and his


PRINCIPLES
OF
GEOLOGY,
BEING
AN ATTEMPT TO EXPLAIN THE FORMER CHANGES
OF THE EARTH'S SURFACE,
BY REFERENCE TO CAUSES NOW IN OPERATION.
BY
CHARLES LYELL, Esq., F.R.S.
FOR. SEC. TO THE GEOL. SOC., &c.
IN TWO VOLUMES.
Vol. I.
LONDON:
JOHN MURRAY, ALBEMARLE-STREET.



Charles Lyell. *Principles*. Vol II & Vol. III

observations in South America confirmed and supported Lyell's theory of Uniformitarianism, which challenged the then prevalent notion of catastrophism in geology. On Darwin's return from the voyage in 1836 a warm friendship developed between the two men and Darwin explained his theory of natural selection to Lyell in 1856. Despite Lyell's urgings to publish it, Darwin deferred in order to gather more evidence. It took the stimulus of Wallace's letter in 1858 to goad him into action, and Lyell was instrumental in having Darwin's views made public. In his 1863 *Geological Evidences of the Antiquity of Man*, the result of his examination of the early existence of humans in Europe, Lyell was able to demonstrate that humanity had descended over an immense period of time from a common ancestry. If it were true of humans, it had to be true for plants and animals, but Lyell would not fully endorse the theory, and Darwin was very disappointed at his reluctance to draw what seemed to be the obvious conclusions. Finally, in 1868, while he was preparing the tenth edition of the *Principles of Geology* he was converted to the theory and completely reworked the text to conform with Darwin's principles. He also expressed his wholehearted conviction of the truth of the theory of natural selection.

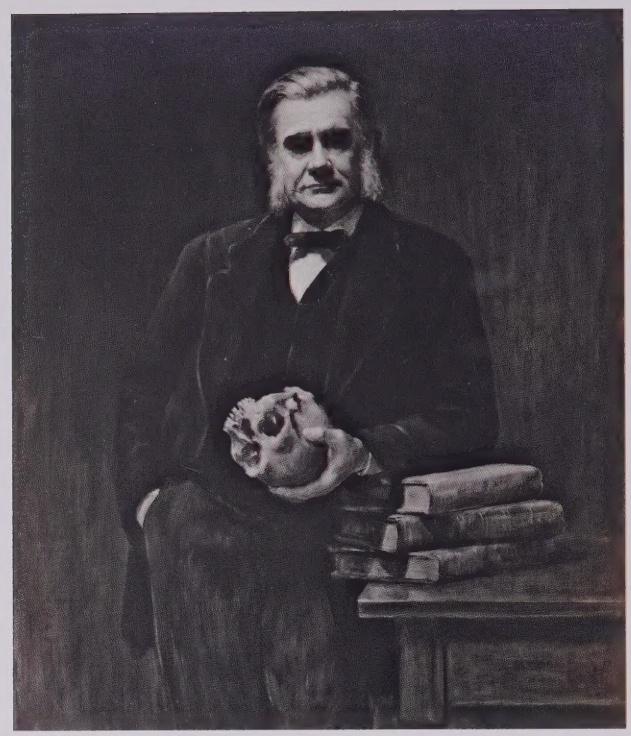
Darwin became acquainted with the Rev. Adam Sedgwick (1785-1873) during his years at Cambridge, where Sedgwick was Professor of Geology from 1818 to 1873. Darwin did not attend his lectures, but did accompany him on a geological walking tour of North Wales in 1831. After the appearance of the *Journal of Researches* Sedgwick predicted Darwin would have 'a great name among the naturalists of Europe'. His estimation changed after he read the first edition of *Origin* which Darwin had sent him. 'I have read your book with more pain than pleasure' he wrote and his deeply felt religious beliefs forced him to condemn it as pernicious. Despite their opposing views, the personal relationship between the two men remained cordial throughout their lives.

Joseph Dalton Hooker (1817-1911), succeeded his father, William Jackson Hooker, as Director of Kew Gardens in 1865. He was Darwin's closest friend and confidant, whose botanical knowledge was indispensable to Darwin for many of his books. He also made available a great many specimens of plants for Darwin's researches. Hooker was acquainted with the theory of natural selection as early as 1844, but he did not accept it fully until he published *Flora Tasmaniae* in 1860. His objections were

not ideological, but scientific, for he found much of Darwin's evidence inconclusive. Although often at Down House and thus privy to Darwin's experiments and thoughts, Hooker waited until the publication of *Origin* before openly declaring his conviction of its truth. Hooker continued to advocate and defend the theory for the rest of his long and distinguished career; he both utilized the theory before it was published and was still around to celebrate the fiftieth anniversary of *Origin* at Cambridge in 1909.

Alfred Russel Wallace (1823-1913) also had a long and distinguished career. His formal education ended at Hertford Grammar School, after which he became a land surveyor. He and Henry Walter Bates explored the Amazon basin from 1848 to 1852 collecting natural history specimens to sell in England, and in 1854, he left for the Malay Archipelago with the same purpose, an expedition that lasted until 1862. His first published paper on evolution, 'On the Law which has Regulated the Introduction of New Species' appreared in *Annals and Magazine of Natural History* in 1855, but attracted little notice. By this time he was acquainted with Darwin and his work and sent to him the paper which was read to the Linnean Society as a part of *Tendency of Species* on 1 July 1858. Upon his return to England Wallace relied on the sale of specimens and authorship for his living until 1881, when he was granted a civil list pension of £200 per annum, instigated by Darwin and Hooker. He wrote several books on evolution, including *Contributions to the Theory of Natural Selection* (1870); *Geographical Distribution of Animals* (1876), an important work which laid the foundation of evolutionary zoogeography; and *Island Life* (1880), which examined the variation, distribution, and dispersal of insular flora and fauna. *Darwinism* (1889), a term made popular by the *Atheneum* in 1871, summarized Wallace's mature reflections on thirty years of evolutionary biology centred on Darwin's research and publications, and became the most authoritative statement on the subject of his time.

Although the modest Wallace greatly revered Darwin and often visited Down House, he disagreed with him over the question of the descent of man. Converting to spiritualism in the 1860s, he maintained that man had partially escaped the power of natural selection and could himself influence organic change by selection. He further advocated the belief that man's moral and intellectual nature had been uniquely formed by a divine intelligence and such a conclusion, from evidence that Wallace clearly



Thomas Henry Huxley

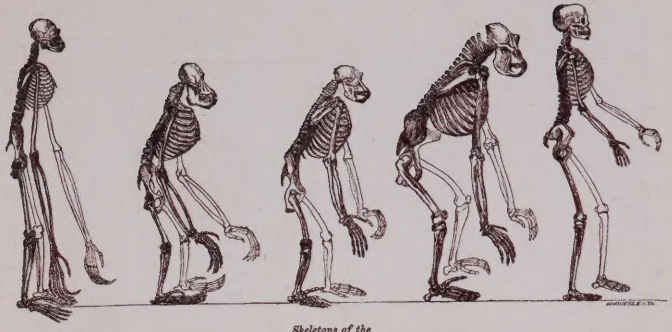
understood, shocked Darwin. He wrote, sadly, to Wallace in 1870, 'I fear we shall never quite understand each other'. Wallace's later works, such as *The Wonderful Century* (1898), *Man's Place in the Universe* (1903), and *Is Mars Habitable?* (1908) did not enhance his scientific reputation and neither did his spiritualism, his campaign against vaccination, and his advocacy of socialism. Yet his reputation remained primarily as a Darwinian, and when he visited the University of Toronto in 1887 Sir Daniel Wilson, the President, noted in his diary that his lectures were 'driving the

Roderick Impey Murchison by T.H. Huxley

Baptists into setting up a university of their own ... The very name Darwin is to most of them like a red rag to a bull; and the greater their ignorance the more pronounced their dogmatism'.

The first letter Darwin wrote to Thomas Henry Huxley, whom he met in 1851, was printed as part of Huxley's *Testimonial* application for the Chair of Natural History at the University of Toronto. Having just returned from a four-year expedition as a surgeon-naturalist on the *Rattlesnake*, which spent most of its time anchored off the coast of Australia, Huxley was impatient to establish himself in a scientific position. By 1854, when he was made Professor of Natural History at the School of Mines in London, he had become an intimate of Darwin, advised him in his research on barnacles, and was prominently acknowledged in *Origin*. Like Hooker and Lyell, Huxley was at first sceptical of the theory of natural selection when Darwin described it to him, but upon the publication of *Origin* he became convinced of its veracity and demanded that it be judged on scientific grounds. In 1860 he remarked, 'How extremely stupid of me not to have thought of that' and after his famous confrontation with Samuel Wilberforce, Bishop of Oxford, at the British Association meeting in Oxford in that year he became, in his own words, 'Darwin's bull-dog'. Because he revelled in polemical disputes he was eager and willing to extend the theory explicitly to include mankind in the discussion of natural selection and in 1863 published *Evidence as to Man's Place in Nature*. It investigated humanity in zoological terms, and demonstrated that the differences between humans and apes were less than those between the apes and the lower primates. The book's graphic frontispiece emphasized its conclusion even for those who did not bother to read the text. Although he was known chiefly as a defender of Darwinism, a trenchant teacher of science, and a forceful and witty essayist, Huxley's independent scientific work in invertebrate and vertebrate zoology and paleontology earned him a prominent place in the intellectual history of the nineteenth century, a legacy continued by his descendants through the twentieth century.

Herbert Spencer (1820-1903), considered the greatest philosopher of his time, wrote voluminously on a wide range of scientific, political, and social subjects, although he had little formal training in any of them. While reading biological treatises he came across Karl Ernst von Baer's idea of progressive differentiation, which Spencer grafted onto the Lamarkian notion of



GIBBON. ORANG. *Skeletons of the* CHIMPANZEE. GORILLA. MAN.

Photographically reduced from Diagrams of the natural size (except that of the Gibbon, which was twice as large as nature), drawn by Mr. Waterhouse Hawkins from specimens in the Museum of the Royal College of Surgeons.

Mary N Aitchison 1884

EVIDENCE

AS TO

MAN'S PLACE IN NATURE.

BY

THOMAS HENRY HUXLEY,

FELLOW OF THE ROYAL SOCIETY.

WILLIAMS AND NORGATE,

14, HENRIETTA STREET, COVENT GARDEN, LONDON;

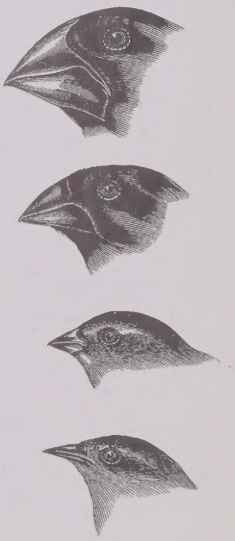
AND

20, SOUTH FREDERICK STREET, EDINBURGH.

1863.

adaptation, to arrive at his own principle of evolution. Spencer introduced his theory in an abstract and speculative essay, 'Development Hypothesis', published in *The Leader* in 1852. In the same year another essay, 'Theory of Population', appeared in the *Westminster Review*, where he proposed that the pressure of population was the agent of progress. Had he connected these two theories he might have arrived at a theory of natural selection and he expressed his regret for not having done so, although he would, of course, have lacked the observed scientific evidence. Spencer's eclecticism and speculative methodology annoyed many of his scientific contemporaries, including Darwin, who remarked to Lyell, 'somehow I never feel any wiser after reading him, but often feel mistified'. He was, however, a popularizer of both the concept and the word 'evolution'. He also coined the phrase 'survival of the fittest', which was used by Darwin in *Origin*, and was acknowledged in the 'Historical Sketch'. Spencer also formulated the principles of evolutionary ethics, in which moral conduct is defined as that which contributes to man's better adaptation to his environment and to his higher evolution.

Charles Kingsley (1819-1875), the Anglican clergyman, novelist, controversialist, and sometime naturalist, was sent a complimentary copy of the first edition of *Origin*, perhaps because Darwin knew of his liberal theological views and his interest in natural history. On 18 November 1859 he wrote to Darwin, thanking him profusely and saying, 'that the Naturalist whom, of all naturalists living, I most wish to know & to learn from, should have sent a sciolist like me his book, encourages me at least to observe more carefully, & think more slowly'. He went on to note that, 'I have gradually learnt to see that it is just as noble a conception of Deity, to believe that he created primal forms capable of self development into all forms needful *pro tempore* & *pro loco*, as to believe that He required a fresh act of intervention to supply the lacunas wh. He himself had made'. Darwin was very pleased with this unexpected expression of support and received permission to quote the latter sentence in the second edition of *Origin* (p. 481), referring to Kingsley only as 'a celebrated author and divine', and altering the final phrase to read, 'to supply the voids caused by the action of His laws'.



In the second known letter from Darwin to Kingsley, very recently acquired by the Fisher Library, and dated 1 December [1859], he wrote warmly, commending Kingsley's essay 'My

Ilkley Wells House
Otley Yorkshire

Dec 1 [1859]

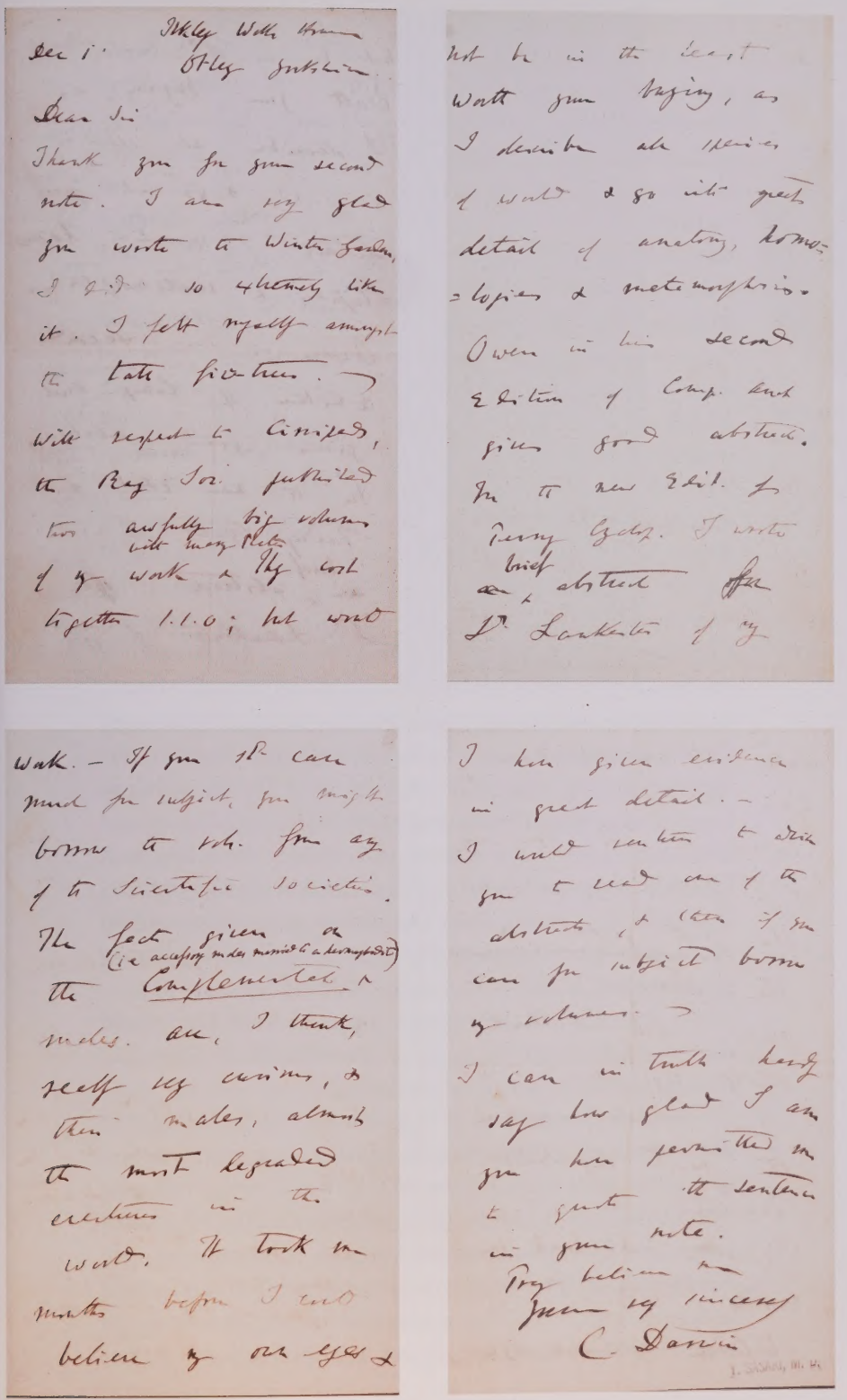
Dear Sir
Thank you for your second note. I am very glad you wrote the Winter Garden, I did so extremely like it. I felt myself amongst the tall fir-trees.—— With respect to Cirripeds, the Ray Soc. published two awfully big volumes of my work with many Plates. They cost together 1.1.0; but would not be in the least worth your buying, as I describe all species of world & go into great detail of anatomy, homologies & metamorphosis. Owen in his second Edition of Comp. Anat gives good abstract. In the new Edit. of Penny Cyclop. I wrote a brief abstract for D^{r}. Lankester of my work.—— If you sh^{d} care much for subject, you might borrow the vols. from any of the Scientific societies. The facts given on the Complemental (i e accessory males married to a hermaphrodite) males are, I think, really very curious, & these males, almost the most degraded creatures in the world. It took me months before I could believe my own eyes & I have given evidence in great detail. I would venture to advise you to read one of the abstracts, & then if you care for subject borrow my volumes.—— I can in truth hardly say how glad I am you have permitted me to quote the sentence in your note.

Pray believe me
Yours very sincerely
C. Darwin

Transcription of letter to Charles Kingsley

Winter Garden' (*Fraser's Magazine*, January 1858). He also discussed his books on barnacles, especially the hermaphrodite males, and thanked him for permission to quote from the letter of 18 November. Darwin was convalescing at Ilkley Wells House in Otley, Yorkshire after the publication of *Origin*. The letter is published for the first time in this catalogue.

Kingsley went on to write his most enduringly popular book, *The Water Babies*, a Darwinian tale for children in which little Tom, a chimney sweep, escapes from his cruel master, falls into a river, and becomes a 'water-baby', in a kind of evolutionary moral journey which includes much satirical commentary on the



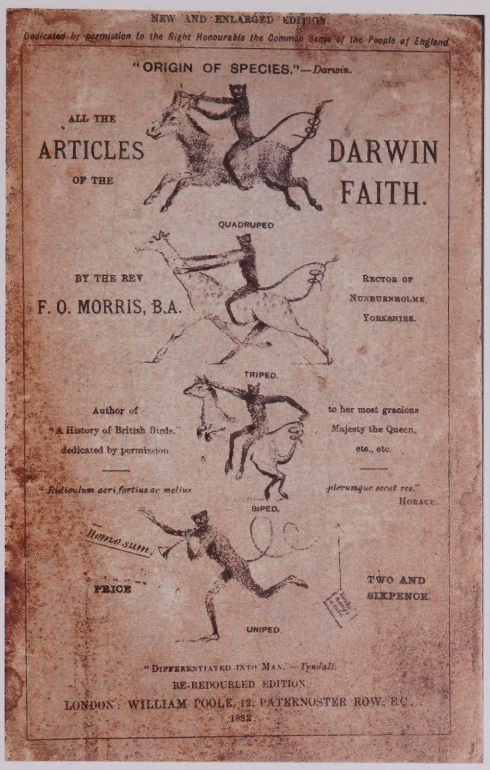
Holograph letter to Charles Kingsley

Frontispiece from *The Water Babies*

controversies engendered by the publication of *Origin*.

St. George Jackson Mivart (1827-1900), a barrister and biologist, was an early supporter of the theory of natural selection and was elected Fellow of the Royal Society in 1869. He was also an ardent Roman Catholic and by 1871 had become one of the most vociferous anti-Darwinians. His reputation was founded on his 1871 book, *Genesis of Species*, which, as Darwin admitted, was a formidable piece of scientific criticism though spoiled, he said in a letter to Wallace, by being 'stimulated by theological fervour'. Mivart accumulated all the previous criticisms of *Origin* and cited the contradictory opinions expressed by Darwin's supporters and even by Darwin himself, with much personal disparagement. Mivart proposed his own evolutionary theory: that an 'internal innate force' was the main agent of evolution, and was attributable to the direct intervention of God. Thus humans could be distinguished from other animals by virtue of their mental powers and souls. This critique provoked Darwin into one of his few forays into direct involvement in controversy. At his own expense he published a paper by the American naturalist Chauncey Wright called *Darwinism: Being an Examination of Mr. St. George Mivart's Genesis of Species*, which exposed Mivart's deliberate misrepresentation and distortion of facts. Futhermore, Darwin added a new chapter to the sixth edition of *Origin* in 1872 expressly directed against Mivart. Eventually Darwin withdrew from direct participation in the controversy, leaving Huxley and Wright to carry on the dispute, with Huxley correcting both Mivart's biology and his theological doctrine in the *Contemporary Review*. In his 'Autobiography' Darwin was able to forgive all his critics, with the exception of Mivart, whom he condemned as a religious bigot. In 1876 Mivart was awarded an honorary doctorate by Pope Pius IX, presumably for his defence of Catholic doctrine. However, he was excommunicated from the Church in 1900 for his rejection of papal infallibility.

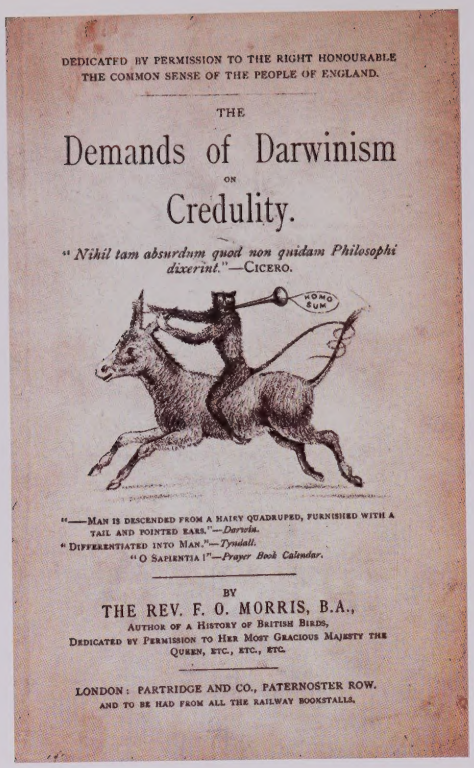
Darwin's champion in the United States was Asa Gray (1810-1888), a Harvard botanist whom he had met before 1855. Gray was sent a copy of the first edition of *Origin* and arranged for the authorized American edition to be published in 1860. He tried to ensure that Darwin's views were given a fair hearing among American scientists and defended the theory of natural selection against its detractors in a series of sympathetic yet critical reviews which Darwin admired and praised in his extensive correspon-



One of many reactions to Darwin's theories by the Rev. Francis Orpen Morris, 1875

dence with Gray. The numerous reviews and essays by Gray were collected and incorporated into his book *Darwiniana* in 1876. Gray was also one of the first critics to tackle seriously the theological significance of Darwin's theory. He was able to argue convincingly that natural selection was not inconsistent with natural theology, and defended this conviction against the militant anti-Darwinian theologians on the one hand, and against the positivist and materialist pro-Darwinists on the other.

Darwin's theory received an immediate and enthusiastic reception in Germany owing to the efforts of Fritz Müller (1822-1897), August Weismann (1834-1914), and Ernst Haeckel (1834-1919). The first German edition of *Origin* appeared in 1860 and had a profound influence on each of these scientists, determining much of the future direction of their work. None of the three, however, was content to accept natural selection exactly as Darwin had expressed it, with Weismann and Haeckel in particular seeking to carry the theory beyond its intended application. Müller and Darwin never met, but through correspondence enjoyed 'uninterrupted friendship and scientific comradeship' and *Für Darwin* (1864) was a major contribution to evolutionary


DEDICATED BY PERMISSION TO THE RIGHT HONOURABLE
THE COMMON SENSE OF THE PEOPLE OF ENGLAND.

THE

Demands of Darwinism

ON

Credulity.

"*Nihil tam absurdum quod non quidam Philosophi dixerint.*"—CICERO.

HOMO SUM

"—MAN IS DESCENDED FROM A HAIRY QUADRUPED, FURNISHED WITH A TAIL AND POINTED EARS."—*Darwin.*
"DIFFERENTIATED INTO MAN."—*Tyndall.*
"O SAPIENTIA!"—*Prayer Book Calendar.*

BY

THE REV. F. O. MORRIS, B.A.,

AUTHOR OF A HISTORY OF BRITISH BIRDS,
DEDICATED BY PERMISSION TO HER MOST GRACIOUS MAJESTY THE QUEEN, ETC., ETC., ETC.

LONDON: PARTRIDGE AND CO., PATERNOSTER ROW.
AND TO BE HAD FROM ALL THE RAILWAY BOOKSTALLS.

Morris, and many others, continued to ridicule Darwinism long after his death, 1890

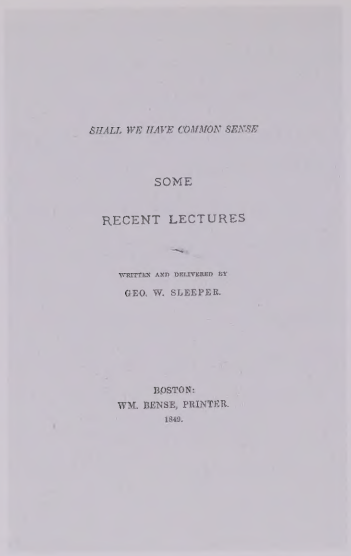
theory. Müller's scientific research encompassed marine zoology, anatomy, entomology, and botany, and *Für Darwin* is one of the first statements of the recapitulation theory and an important contribution to the theory of mimicry. In Brazil Müller applied Darwin's theory to crustacea, proving to his own satisfaction that natural selection provided the key to the developmental history of these organisms. Darwin arranged for an English translation of *Für Darwin* to be undertaken by W.S. Dallas, entitled *Facts and Arguments for Darwin*, in 1869 and extended the compliment by having Murray issue it in the same binding style as *Origin*.

The principal contributions of the entomologist August Weismann to Darwinian theories were his *Über die Berechtigung der Darwin'schen Theorie* (1868) and *Studien zur Descendenztheorie* (1875-1876), the English translation (1882) of which included a prefatory notice by Darwin. Sceptical of Darwin's hypothesis of pangenesis, Weismann developed his own theory of heredity, involving the distinction between germ cells and somatic cells. He was able to demonstrate that only germ cells were involved in reproduction and were inherited, while somatic cells could be modified by environment, but the modifications could not be

passed on unless they were attached to the germ cells. His work proved very important for the advancing field of genetics.

Ernst Haeckel was known as the apostle of Darwinism in Germany and the theory of natural selection provided the basis for his work in marine zoology. His much grander purpose, however, was the complete reform of biology and the development of a scientific world-view based on evolutionary principles, often without much supporting evidence. His *Generelle Morphologie der Organismen*, published in 1866, contained philosophical, political, and religious speculations drawn from evolutionary theory that made many scientists very nervous indeed. Darwin wrote to him in 1868, 'your boldness sometimes makes me tremble' and Haeckel boldly drew genealogical family trees for all manner of organisms, including man, based on comparative anatomy and following the work of Huxley. A very popular author, he wrote many books, including one on Darwin, Goethe, and Lamarck. Huxley called him the 'Coryphaeus' (chorus-leader) of the Darwinian movement in Germany and his zealous advocacy contributed to a breakthrough of evolutionary thought in the development of biological theories.

A more unusual aspect of Darwinism was the gift Alfred Russel Wallace received to mark the occasion of his ninetieth birthday on 6 February 1913. It was a thirty-six page pamphlet called *Shall We Have Common Sense? Some Recent Lectures Written and Delivered by Geo. W. Sleeper*, with the imprint 'Boston: Wm. Bense, Printer. 1849'. The pamphlet had been sent to Wallace by a Mr. B.R. Miller from the United States who claimed to have obtained it from a book shop in either Cleveland or Cincinnati. Wallace read his present and, struck by its anticipation of 'diverging lines of descent from a common ancestor and of the transmission of disease germs by means of insects', sent it on to Edward B. Poulton, then President of the Linnean Society and an eminent Darwinian. Poulton was also struck by the pamphlet's originality and its clear anticipation of the theory of natural selection to the extent that it became the topic of his presidential addresses to the Society for 1913 and 1914. Poulton wrote: 'Supposing the work to be genuine, I doubt whether so much of pregnant thought and penetrating imagination has ever before been recorded in so small a compass'. It had, after all, taken Darwin 509 pages in the first edition of *Origin* and he hadn't got as far as the germ theory of disease.



SHALL WE HAVE COMMON SENSE

SOME

RECENT LECTURES

WRITTAN AND DELIVERED BY

GEO. W. SLEEPER.

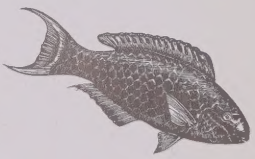
BOSTON:
WM. BENSE, PRINTER.
1849.

Poulton was, however, a scientist with a fondness for demonstrable proofs of theories and a sceptic, so he subjected the pamphlet to various physical tests. Initially he was told by authorities on paper and type that the pamphlet's appearance was consistent with its supposed date of printing. However, when he attempted to trace its copyright record (it had a notice of copyright on the verso of the title-leaf), no information could be found and the first examination proved inconclusive.

The following year Poulton again took up the investigation and entered into an extensive correspondence with Mr. J.F. Sleeper, the son of G.W. Sleeper, who produced various documents, including the elder Sleeper's diary, in support of the pamphlet. Poulton continued to pursue typographical and paper evidence and was told by the manager of the American Type Founders' Company in Boston that the title page could not have been set in 1849 because some of the faces used were not available until the mid-1870s. The paper, it was concluded, was of Dutch manufacture with a forged Whatman watermark, and therefore could not be accurately dated. The decisive evidence was provided by a manuscript contract between Sleeper and the printer dated 1849, which itself seemed to be a forgery. Poulton was also bothered by the use of the word 'agnostic', which was introduced into English by T.H. Huxley in 1869. His conclusion was that *Shall We Have Common Sense?* was fraudulent and probably had been manufactured after the death of G.W. Sleeper in 1903.

There really was a George Washington Sleeper. He was born in Baltimore in 1826, ran a prosperous tea business in Boston and Providence, but was financially ruined by the Civil War. He had strong opinions about many subjects which he was prone to express in public and was much ridiculed by his fellow citizens. He evidently felt persecuted and neglected and his paranoia intensified with age. Poulton, sensitive to the feelings of the son, concluded that the elder Sleeper wrote the pamphlet himself before his death, but it seems likely that the forger was J.F. Sleeper.

The response to the publication of *Origin* and the development of Darwinism have had a profound impact on scientific discourse thoughout the Western world and beyond. The controversies engendered by the resulting debates have reverberated thoughout all aspects of society and have continued to this day. Universities, especially the relatively modern ones, experienced the direct influence of the theory of natural selection right from the beginning and the University of Toronto was no exception. Having turned down Huxley in 1851 and Tyndall in 1853, Toronto struggled to deal with Darwin's ideas after 1859 and, as Martin Friedland has pointed out in his *The University of Toronto: A History*, even though it was considered a 'godless university' almost everyone believed in God, the only question being how to communicate with him. William Hincks, the Chair of Natural History, concocted a detailed scheme to refute Darwin, but in a paper published in 1866 fell back on the 'unity of plan and perfection in power, Supreme in Wisdom and Benevolence'. Even Daniel Wilson, a pioneer of the study of anthropology and whose major work, *Prehistoric Man*, was published in 1862, was not prepared to abandon biblical chronology. By the 1876 third edition, however, he had accepted the great antiquity of human origins and the probable descent from apes. He still tried to cover both worlds by writing that 'the transformation from ape to human had been an instantaneous one, in which a soul had been infused into an animal body'. Ramsay Wright in the 1870s proclaimed publicly that the origin of species, including humans, had been 'definitely settled' by Darwin and there the matter rested, at least for the university scientific community. That the University of Toronto developed one of the largest collections in the world of Charles Darwin and his associates would no doubt have surprised them all.



Sources

I have relied primarily on the works of Charles Darwin himself and the works of the other scientists who published on evolutionary topics. There exists a very extensive secondary literature on Darwinism and I have, over many years, read much of it. I am particularly indebted to Richard Freeman's *The Works of Charles Darwin: An Annotated Bibliographical Handlist* (2nd edition revised and enlarged, 1977) and his *Charles Darwin: A Companion* (1978). I have also been greatly assisted by E. Janet Browne's wonderful biography, *Charles Darwin*, Vol. I, *Voyaging* (1995) and Vol. II, *The Power of Place* (2002). The small marginal decorations are wood engravings by Robert Gibbings and Paul Landacre.

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